



FRIDAY, JULY 2.

The Freight Brake Tests at Burlington.

The American Brake Company, of St. Louis, sends us the following note in relation to its share in the brake tests at Burlington, Ia., under charge of the Master Car-Builders' Association:

"As you have been informed, the Missouri Car & Foundry Co. is building for this company the 50 cars to be used by us in the forthcoming brake test, July 13. The partial destruction of the car works by fire on the night of June 18 will prevent the delivery of the cars on the date contracted, and consequently make it impossible for us to be on the ground at the beginning of the test; but through the promptness and enterprise of the car company in getting the works in running order, the delay will not be serious, and the Brake Committee have very considerably extended our time so as to enable us to enter the test, stating the delay will not materially interfere with their original arrangements. We are assured our train will be ready by July 15, and no effort will be spared by us to be ready at the earliest day possible."

This action of the Brake Committee was to be expected, and is entirely proper, in view of the facts that the American Brake Co. will be one of the leading competitors, and that the slight delay results from a misfortune which was entirely unforeseen and unavoidable.

Committee Reports to the Master Mechanics' Association.

We continue this week the publication of the reports submitted by committees to the Master Mechanics' Association at the recent convention in Boston.

DRIVING-WHEEL BRAKES.

A thorough and satisfactory discussion of the value and suitability of any of the mechanical appliances for securing brake power is possible only after a clear conception is obtained of the nature of frictional resistances as shown by experiment; and the most important point to be borne in mind is the difference in the character of sliding and rolling friction.

Sliding friction (that of all shafting and axles in their journal-boxes and cross-heads on slide-bars) is a varying but always large and measurable quantity, comparatively low in amount as velocity diminishes.

In the rolling of a cylinder on a plane, even if the surfaces are not as perfect as those usually provided for sliding, the frictional resistance resulting is very small, and the relative motion is not that of one surface rubbing past another, so that it is quite proper to say that at the actual point of contact between circle and line these extremely limited surfaces are for the moment at rest with reference to each other, or to say they are moving at equal and similar speeds.

Hence, the positive resistance to motion due to the contact of wheel with rail may for our purpose at least be considered nil, as long as ordinary conditions prevail. But the primary object in the application of brake resistance is to disturb these ordinary conditions, so that the touch of wheel on rail, instead of being a rolling and therefore almost frictionless contact, shall become that of sliding or rubbing at very low velocity, thus securing the highest co-efficient of frictional resistance possible between two given metallic surfaces moving on each other, and achieving the final result of bringing the train to rest in the shortest time and distance.

For with engine and train in motion, all that we can do to bring it to rest is to create additional friction, and that of the brake-block on the tire is only a means to an intermediate, most necessary, but (as our patent office shows) not self-evident end, viz.: The creation of friction between rail and wheel, the two surfaces that are in rolling (or equal speed) contact, but that must be put into slow sliding contact; for, although the sliding friction of block on tire will soon destroy the centrifugal motion of wheel and axle, centrifugal force forms but a small fraction of the momentum tending to keep the mass in rapid horizontal movement.

We need not go to the mathematical labor of getting the square of the centre of gyration of a hollow-spoke cast wheel (which would be necessary for any close comparison), but it can safely be said, that in the worst case the centrifugal power in the wheels (tending by their rotative contact with rail to keep the train in motion), is at any speed but from 5 to 7 per cent. of the total momentum or power requiring to be neutralized by the opposing brake; the remainder of the brake force if properly employed is used in producing sliding at low velocity or destroying rolling contact between tire and rail, this being its main and legitimate duty. Therefore any force or mechanical combination, other than the application of brake-blocks, may be used if it will result in producing this difference in touch between tire and rail; as our object is to change the contact from rolling to sliding, yet at the same time keep the sliding velocity exceedingly low, because the lower the sliding speed the greater the frictional resistance. It is now self-evident why we endeavor to avoid skidding the wheels; as, when that is done, although tire is certainly sliding upon rail, the velocity of this sliding is high and the co-efficient of friction correspondingly low, and the resistance to neutralize the momentum of the train is low.

Thus the locking of the wheels, although it looks so effective in the eyes of a green employe, and has often been the object aimed at by quite as verdant a patentee, is a gross mistake; in effect not only injuring rail and tire, but absolutely lessening the frictional resistance between them, which is all we have to depend upon. The maximum is attained when the wheel is revolving with a peripheral speed almost but not quite equal to that of the train, and no further resistance to motion with the modern train equipment is possible. Our object then in the application of brakes is to attain just this slight difference in the nature of the touch between tire and rail; more we cannot get, and less is a defect.

Possibly it might assist in opening a discussion on the theory of brake resistance if the members gave their opinion on the following actual case: a train on a long falling grade became uncontrollable; the ordinary brakes and the driver-brake not proving sufficient to check the speed, the engineer reversed the engine and opened regulator-valve without releasing the driver brake. Do you think he should have released the driver brake before reversing? Two elaborate reports were made on this case, one approving the man's action, the other disapproving and holding him responsible for the accident that followed.

Before giving the substance of the replies to our circular of inquiry, it would perhaps be advisable to give a few historical notes on the application of driver brakes. In 1855 the Baldwin Co. affixed them on an eight-wheel coupled engine or the Mine Hill Railroad of Pennsylvania. There were locks on the two back pair of drivers, actuated by a shaft cross the engine, the shaft being operated by a chain and

windlass. The earliest English application known to your committee was in or previous to 1848, by Sharp, of Manchester, who on a tank engine applied wood blocks between the single driving and small trailing wheel, having wedge links (or toggle joint) actuated by vertical screw and horizontal hand wheel on foot plate; this arrangement, although it applied but one block on each of two wheels of unequal diameter on one side of engine only, is to-day a model of neat design and proportion. D. Gooche in 1850 used a sled brake, about 5 ft. long, to ride on rail between driving wheels, actuated by hand screw and toggle joint; but it proved neither safe nor effective. One reason why neither this nor W. B. Adams' skid brake-shoe (sliding down to rail on a diagonal frame bar) proved effective we now know to be from the same cause that skidded wheels are not effective in giving the fullest resistance to motion, viz.: The velocity of the surfaces in contact is too high, and therefore the co-efficient of frictional resistance is low.

As early or even before 1837, John Melling, of the Liverpool & Manchester Railway, George Stephenson's first master mechanic, designed and experimented with a contrivance for utilizing, in emergency, the adhesive power of a second pair of driving wheels, without the use of side-rods, i. e., steam pistons, working in small brass cylinders, on each side of boiler, were coupled to a transverse axle carrying on each end a free running wheel or idler. These small idler wheels when required were forced into frictional contact with and between the tires of main driving and trailing wheels. This device, although not a successful expedient for allowing an engine to be worked either with the freedom of a single driver, or with the extra adhesion due to coupled drivers was fairly but unexpectedly a success as a driver brake; however, the low speed and limited traffic of 50 years ago rendered a driver brake practically superfluous, and the material soon found its way to the scrap-heap.

In answer to the Committee's query, "Should brakes be applied to the wheels of all engines?" 19 said yes, on all drivers; 3 would like to restrict them to freight or switches; and 2 are more or less opposed to their application, a few saying they have no experience or know of no satisfactory brake. Of these replies (to the disgrace of our lazy members, be it said) 8 were from engineers not members of this association, but representing an experience with many thousand engines, and if the replies in general be not treated numerically, but considered as the casting of votes equivalent to engines represented, they show an overwhelming majority in favor of the application of brakes on all engines. Mr. Lockwood lent us the official Board of Trade returns for 1884, showing in Great Britain a total of 4,177 locomotives so equipped (a personal recount makes the total 4,183), divided as follows: Various forms of vacuum, 2,990; Westinghouse plenum, 1,049; steam, 59; and all other types, 85; also it should be stated that in some cases engines are provided with two or more sources of brake-power as vacuum, steam and hand power. It would be of interest were official American statistics available for comparison. Mr. Stevens on the Lake Shore, 90 Westinghouse and 364 steam. Mr. Swanston recommends each railway to use one system, as it entails less confusion, less risk, less experience and less duplicate material for repairs. The motives and reasons for recommending the application of a driver-brake, which certainly does not lengthen the life of an engine considered simply as a power producing machine, are various. Some think that as the whole weight gives momentum, as large a portion of the total weight should be braked as possible. Some say their great value and only service should be for use in emergency stops, whereas others would use them on passenger engines, because they should stop quick, on switches because they stop very often, and on freights because freight trains are deficient in brake power at best of times. Another consideration is the lighter duty falling on to car draw-bars, which are often said to be strained when all the brakes are in rear.

Granting, then, by reason of modern high speeds and density of business, the traffic necessity for driver brakes, what are the points that discourage their application? Do they increase the cost of working by lessening tire mileage? Of replies received 11 say yes, or think so; 2 say they do not know, or think not, and 8 say definitely they do not, a few of the latter going so far as to say that if the proper form of shoe is used, so as to bear upon that portion of tire tread and flange not worn by rail, an increased mileage can be obtained.

Do driver brakes lessen engine mileage between repairs? 4 reply yes, or think so; 11 no, not much, or think not; 1 reports a tendency to fracture axle-boxes, etc.; 4 say yes, if wedge type but not if compression type is used, or pressure is equalized, and 5 ignore the query.

On the general question, as to the coupling up of the brake-gear throughout the whole train, its automatic action on drivers, or whether it is advisable to allow a conductor to apply brakes on drivers, opinions vary much, but there is a general feeling in favor of engineers having the opportunity to apply the whole brake-power, restricting the application by conductors to cars or a car and tender only; that is, no one in rear should have the opportunity of applying brakes on drivers while the engine is under steam. There are 3 contra votes, one (the Pennsylvania Railroad) being actually equipped so that automatic action applies driver brakes.

Opinions on this point were asked in view of a free ventilation by discussion before any legislature should take hasty action upon it, or any court take the ground that if the engine-brake be not coupled up and workable from rear, the possible maximum of safe brake resistance to motion is not in the hands of the train staff, and therefore hold the railway company in damages for criminal neglect; and in this light it is curious and interesting to note that a large, if not the largest railway "trades union" has, since the issue of our circular, published a memorandum of 23 requisites that, in their opinion, are necessary for the safe working of rail ways. No. 9 reads: "All passenger trains ought to be provided with an efficient automatic continuous brake, having brake blocks upon the wheels of the engine, tender and every vehicle throughout the train."

If so strong a statement comes from a large class of railroad employes, we need not be surprised should the matter be legislated upon without much consideration and much expert evidence being taken. Therefore the present moment is opportune for its discussion.

Among the replies were the following statements:

Mr. Aspinwall said: "Any form of automatic continuous brake should be capable of being applied by the conductor on all vehicles, as well as by the engineer."

Mr. Ely: "In a general way, I would say that as the traffic on our principal roads and the speed at which the trains are run have so greatly increased as to require extraordinary facilities for controlling the movement of trains, and as these facilities are, so far as we know, limited to the weight of the equipment, the retarding force should be applied to all available parts of the train, and so make the braking power of the equipment most effective in case of emergencies it should be kept in daily use."

Mr. Atkinson: "The application of brakes by conductor should be as rare as possible, and should be subject to gradation exactly as by the engineer, so that he need not and should not apply the whole force unless in emergency; there is then no objection to the conductor's power of applying brakes extending to the tender and engine, but it is rather

beneficial than otherwise, as he could not strain the couplings behind the tender. Of course the engineman would detect the application almost instantly and would shut off steam."

Question No. 9.—"Is there any danger in using a powerful brake at front end only?" was asked, with the intention of finding out if the opinion held by some and well expressed by W. S. Huntington (see letter in *National Car-Builder*, Feb. 1885) was a general opinion. He says, "When a train is running down a grade on a curve, and no brake power is available on the middle and rear portions, powerful application of the brakes to the locomotive and a few of the forward cars causes the flanges of the wheels upon which no brakes are acting to be thrown forcibly against the outer rail, causing mounting and spreading of the rails and derailment. This is the natural result of centrifugal force combined with the suddenly checked momentum of the cars not held by brakes and having no hold on the rails other than the ordinary rolling friction; that is to say, the portion of the train that is suddenly checked is a dangerous obstruction to cars that are not held by brakes, by reason of their tendency to crowd each other past the obstruction in a tangent, assisted by momentum and centrifugal force."

Also, it is noticeable that many cases of derailment occur when an engine is not working steam; especially is this the case with six-wheel-coupled truckless engines, moving round sharp curves. Engines will go safely over a quick curve if exerting a pull, that cannot be certainly counted upon to keep the track; if propelled in front of some other motor; and even on straight track, few railroad officers freely permit the backing up of a train in advance of its engine, and there is legislation forbidding trains being run with engine having tender first.

The explanation for this may not be single or simple in character, but it would appear as if the internal propelling power must be greater than the internal and external resistance combined, to insure safety under the given conditions. If driver brake, and that only, is applied, the mass of the train will then give the forward momentum, or be the propelling power, and the engine wheels will give the frictional resistance in front of the power, subjecting them to possible derailment. This is apparently an element of danger; but whether the hypothesis be a correct view of the case or not, it is satisfactory to find not a single case of trouble due to the application of driver brake only is recorded in the answers received, while 18 state definitely that in their opinion there is no danger, Mr. Worsell adding, "especially when cars are coupled slack." Mr. Aspinall believes there is danger if application is sudden, and he uses a smaller air ejector to obtain a vacuum on freight engines. Mr. Cushing says: "On engine alone there is an element of danger except used with care, * * * especially if considerable slack in couplers."

What percentage of the total weight of the engine can effectively and safely be utilized for brake resistance? If there is no risk or danger in locating a powerful resistance forward of the moving body, no attention to this question is necessary, unless the brake is automatic in application when train separates. In considering this latter case, it should be remembered that it is not judicious, in arranging the lever proportions for any cars, to count upon utilizing more than the tare or empty weight; otherwise, if arranged to take advantage of the increased weight when more or less loaded, then if brake blocks be applied to wheels when car is actually empty, the effect would be to promptly skid them. Hence, if the engine brake is designed to utilize the whole of the weight of engine and tender, and the detached cars in rear be heavily loaded, the latter will, after the brakes have gone on automatically, move with a higher speed than the front end and eventually collide. Such a rear pitch-in could only take place when the brakes on engine and front cars are utilized for resistance to motion, a greater percentage of the total dead weight resting on the braked wheels than was utilized on the rear portion. Some engines have blocks on all wheels—and tank engines lend themselves readily to such an arrangement—but care should be taken to arrange the leverage so as not to utilize the whole insistent weight if the application is to be automatic.

To the somewhat crude question of what percentage of weight on drivers should be utilized, one reply says 7 to 10 per cent.; another, 45 on engine and tender, with 100 on cars; a third, 50 to 60; a fourth, 80; a fifth, 75 to 90; a sixth, 95; and a seventh says twice the weight on drivers, or 200. Captain Galton's experiments—which are now classic—prove that speed is the most important factor in this equation, 200 per cent. being safely used at high speed of 50 or 60 miles per hour without skidding the wheels, but the pressure must be lessened as the speed lessens, if skidding is to be avoided.

In the matter of brake-block shoes, their substance, size and shape, 6 are in favor of cast iron, 7 of wrought iron, and the American Co. say 95 per cent. are of wrought iron, 2 approve of the Cogdon, while 1 prefers wrought to Cogdon. Mr. Webb says: "The best results we obtain" from wood blocks when they can be "conveniently" applied. Those we have in "ordinary" use are of English poplar about 18 x 3½ in.; the face is perforated with fine 1½ in. holes, which are afterward filled with a "mixture of resin and sand," and Mr. Johann, while preferring wrought iron, has obtained excellent results from a head filled with hard wood blocks, as per drawing No. 1, attached. The Eames Co. says: "That material is to be preferred" which yields the quickest stop, with due regard to economy, durability, and effect upon the wheels. Cast iron presents a greater "frictional resistance than wrought iron, much as it granulates and retains a certain degree of roughness throughout" all life of the shoe, instead of becoming smooth and polished, as in the case with wrought iron.

"The wear upon the tires is undoubtedly greater with the cast iron than with wrought iron, but this is the necessary result of its greater braking efficiency. The more effective the brake, the greater the wear of both shoe and tire. The same principle of efficiency applies to the comparative cost of the two materials. The wrought iron shoe has a longer life, and independent of the work performed is cheaper; but when the actual braking power furnished by each is taken into account, cast iron is the most economical."

As to amount of surface, the American Co. averages 60 sq. in.; two replies give a maximum of 88 in., and one a minimum of 36 in., or a difference in length varying from 22 in. to 9 in. The Eames Co. say they "favor the greatest length of shoe that can be conveniently applied. The longer the shoe, the less frequent the replacement; the frictional resistance being the same whatever the length of shoe, the greater the surface of the shoe, the greater the distribution of the wear and consequent life of the shoe. The same principle applies also to the thickness of the shoe, the thicker the greater the durability. As a matter of practice, having regard to all these points, we make our shoes of a length equal to three fourths of the radius of the wheel. * * * Our experience is opposed to the use of channelled shoes because of their liability to cut into the tire. But it is an advantage to have shoes fixed well over the flanges," and five replies indorse this latter statement.

What is the position of block giving greatest efficiency and least interference with the elastic freedom of springs?

Mr. McCrum sends a blue print showing position at angle of 24°, or with block 22 in. long the top is 2½ in. below centre of wheel.

Mr. Cook says toe of shoe should clear rail 4½ in. The reply of five is top of shoe should coincide with centre,

and two say centre of block and of wheel should coincide. Many accept the positions given by the brake companies without question, and these being familiar to all need not be specified. Mr. Atkinson says: "The wedge type should be 45° from vertical, as if too high they tend to throw the pressure on the side of the brass where the blow and wear from the steam thrust takes place. * * * The application of one block at side of wheel interferes with the action of the spring in the proportion that it is effective; the compression type with blocks directly opposed interferes least with spring action. Single blocks on top of wheel would carry part of the load and thus interfere with spring elasticity; if placed on the centre of the rising side would tend to act similarly in decreasing load on spring; while if on the falling side would tend to increase the load on spring. The Committee generally endorse Mr. D. Clarke's statement, that they should be as much below centre as possible, allowing safe rail clearance.

The modes of applying blocks, their number, their position and the choice of wheels they are applied to, is legion. J. Haswell, of Vienna, on a 10-coupled tank-engine, in 1862 tried blocks on the top of the second and third only. Apart from the question of interference with spring action, it is a fair inference that the inner qualities of rail surface severely tested the brake rigging, despite the fact that the power was given through the elastic medium of 2 steam-pistons.

An examination of 110 drawings showing engines equipped with driver-brakes gives the following analysis, viz.: 37 are wedge type, that is, they force adjacent axles apart, and 3 force out coupled but not adjacent axles; 10 are of the compression or grip type, with blocks on both sides of one or more wheels, and 6 compression type on opposite side of coupled but not adjacent wheels; 45 with one or more single blocks in front of wheels (block in going on moves backward), and 9 with one or more single blocks at back of wheel (block in application moves forward). Many of these drawings represent shunting and tank engines, and 17 have every wheel—drivers or carriers—provided with brake shoes.

Many attempts have been made to obtain a driver brake through resistance offered to piston movement, without the destructive effects which commonly accompany steam reversal. Closed exhaust nozzles have been used, so arranged that piston had either vacuum behind or excess pressure in front, and even compressed air has been admitted in front of piston. The most successful of these schemes—one that has been at work for 21 years, and which continues to be applied to new engines on the French and Belgian railways—is the counter-pressure brake of L. Chatellier, which achieves its resistance—after the reversing lever is thrown over—by the introduction of a small jet of boiler water from an opening of $\frac{1}{8}$ to $\frac{1}{4}$ sq. in. area, delivering from 8 to 40 lbs. of hot water per minute in the cylinder exhaust passages, which on release flashes into wet steam, and being drawn into cylinder by piston cools the metal it comes in contact with; the general tendency of other counter-pressure brakes being to heat and cause excessive friction between the moving parts. If sufficient water is admitted part of this steam escapes from the exhaust nozzle, thus fully insuring that from smoke-box no dust shall be drawn into contact with bright metal faces, or gases drawn in and then forced into boiler. A small brass valve and a $1\frac{1}{4}$ in. pipe are the total equipment required for this brake, which is very effective in checking speed and keeping cylinders well lubricated on down grades, and it can be relied on for instant application as long as there is hot water in the boiler. The earlier attempts to inject steam instead of water were not successful, and even mixed steam and water called for too much discretion in application to insure its extensive use.

Mr. Cushing uses driver brake on long grades only as auxiliary, their tendency being to heat and loosen the tires; and it is for steadying on long down grades that counter-pressure has proved so effective.

A handy, effective and well arranged steam driver brake—open it is believed to general use—as designed by Mr. H. Wallis, for shifting and branch engines on the Grand Trunk Railway, is shown by drawings Nos. 2 to 7 attached; they are believed to be self explanatory, but if not so the Committee will gladly answer any inquiries.

Mr. Gurney, agent for the Beal brake, forwarded drawings illustrating the application of that patent. It will be noticed that by a neat arrangement of fixed and floating levers with single connecting bars (which can be of small section, as they do work in tension only), the shoe pressure is put in equilibrium throughout, and as the shoes clasp the wheels, the strain either on frames or machinery is very light. New shoes replacing those worn out can be slipped into place any time without disturbing, to any great extent, the equality of pressure throughout the series, and the single series may include both tender and engine wheels. The parts are light, easy to manufacture, and largely duplicate for tender and engine, as well as for different classes of engines.

Our thanks are due not only to members, but to the following gentlemen and firms, who, although we had no legitimate claim upon them, kindly contributed information, drawings, etc., viz., the

American Brake Co.,
J. A. F. Aspinwall, Great Southern & Western Ry. (Ireland),
R. Atkinson, Canadian Pacific (Canada),
R. Boag, Grand Trunk,
Eames Brake Co.,
T. N. Ely, Pennsylvania Railroad,
W. B. Gurney,
H. Roberts, Chicago & Grand Trunk Ry.,
C. Sacre, M. & L. Ry.

Through the kindness of W. W. Evans, C. E., Associate Member, we are able to give some information as to the slight wear on steel tires gripped with brake-blocks over and above usual tire wear; and although not direct evidence as to the effect of driver-brakes, an examination of the drawing attached will prove interesting. It gives the grouping of and the weights on the wheels, the number of stops made and the absolute wear of tires (braked and unbraked) under the same coach. The wear is so nearly equal that it is impossible by simple examination of the outlines as worn to say which tires did braking duty.

H. A. WHITNEY, } Committee.
J. DAVIS BARNETT, }

Since the foregoing report was written, J. S. Cook, Georgia Railroad, sent us a print and description (herewith attached) of Cosgrove's patent valve, used with Westinghouse equipment, to apply brakes to train or driving-wheels, either separately or together, as desired.

Boston Railroad Grade Crossings.

The bill reported in the Legislature giving authority for the occupancy of land and water areas and the changing of railroad tracks on the north side of the city, which has been referred to in the *Advertiser*, only provides for a contingency. There are four railroad corporations which may, under the authority given, join in the enterprise. It is not probable that all will do so, but it may be regarded as certain that two of them will take action if the bill shall be enacted. These are the Boston & Maine and the Eastern Railroad corporations, which, though combined for the present in the practical operation of their roads, are legally distinct from each

other. There is a possibility that the Fitchburg Railroad may also unite in the enterprise which the bill contemplates.

Glancing at a map of Boston, one is struck by the confused and intricate arrangement of all the incoming railroads. One is almost compelled to believe that each road has tried to see how many others it might cross in reaching its destination. To quote from the Railroad Commissioners: "It is not too much to say that the terminal railroad system at Boston has from the beginning been curiously arranged, so as to effect the least results in the most inconvenient way and at the greatest expenditure of money. There are eight railroads entering the city. In entering they are arranged to cross each other, usually at grade, and in a manner exquisitely complicated. These many crossings, together with separate and inconvenient stations, necessitate delays and dangers which are very annoying to the public. Moreover, the stations of the Maine, the Eastern and the Fitchburg are small, inconveniently arranged and vastly inadequate for the amount of business they are called upon to accommodate. The Lowell station, built in 1874, is larger than the others and better adapted to its business, yet is far from being what one would really call convenient."

All these roads in entering the city cross the Charles River on separate bridges, the Lowell having two, one for freight and one for passenger traffic; thus the river is obstructed by five drawbridges, which are a decided aggravation to the considerable river commerce. The removal of these bridges or of some of them would, no doubt, increase the value of wharf property above them, the delay of vessels at five successive drawbridges being no little consideration. In this connection it might be noticed that colliers are quite often delayed two days in passing the bridges.

Besides the difficulties which are mentioned, the Boston & Maine road runs some distance into the city, crossing two streets, Causeway, a main thoroughfare, and Travers, a smaller street, though one of considerable traffic. This road runs 54 trains a day each way over these crossings, besides all the shifting of trains, which probably trebles this number, making about 324 trains crossing at each street, and these are between 6 a. m. and 11 p. m. This gives one crossing to every three minutes, approximately, and conveys some idea of the delay and danger to street traffic, to say nothing of the annoyance to trains.

Crossing over the river and considering the difficulties on the out of town side, first, as will be seen by consulting the accompanying map, at Frison Point the Fitchburg crosses at grade the Boston & Maine and the Eastern, and passing along a little farther crosses the Grand Junction, a branch of the Boston & Albany Railroad; running back along the Grand Junction, it, together with the Maine and the Eastern, crosses the Mystic Branch of the Lowell, and almost at the same point the Maine and the Eastern cross, making in all seven crossings.

At the Maine-Eastern crossing at Somerville there are each way 62 crossings by the Maine and as many by the Eastern, exclusive of shifting freight, which will at least double the number, making a crossing every two minutes between 6 a. m. and 11 p. m. The crossing of these roads and the Grand Junction with the Mystic Branch are not as dangerous, for comparatively few trains are run over the latter road, say perhaps 10 a day. However, considering the delay, these crossings require just as much time as the others. Considering the Maine-Fitchburg crossing, there are 62 crossings each way by the Maine and 67 by the Fitchburg, exclusive of shifting, which doubles the number, making 506 crossings or one every two minutes during the time considered. At the Eastern-Fitchburg crossing there are about 62 crossings by the Eastern and 37 by the Fitchburg, which gives, as at the Maine-Fitchburg crossing, about one crossing every two minutes.

Taking into consideration the time a train requires in passing one of these crossings, it will be seen that there are trains on them during most of the time mentioned, and thus we can get an idea of their extreme danger and inconvenience. It is interesting to note and must be highly satisfactory to the railroad managers, that only a very few serious accidents have ever occurred at these crossings.

In the event of the union of the three corporations to which we have referred, all freight accommodations will be provided for on the north of the union station and west of Causeway street, and the Haymarket square building will cease to be used for railroad purposes.—*Boston Advertiser*.

Contributions.

Locomotives of American Types in Europe.

WINTERTHUR, Switzerland, May 2, 1886.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It might interest your readers to know about the progress American ideas and constructions are gaining abroad. Therefore, I take the liberty to send to you two photographs of locomotive engines of combined American and European patterns. The engines have been designed by me and built at the well-known Swiss Locomotive Works at this place for the State Railroads of Finland.

The Mogul engines are to run on the Wasa & Uleaborg line, an extension of the government railroads, now the most northerly railroad of the world. In a few years Europe will have a still more northerly railroad, the Lulea & Ofoten, across the Scandinavian peninsula, but the work on that line is scarcely commenced. One part of the Wasa & Uleaborg line is already opened for traffic, and in a few months the whole line will be completed. The engines have plate frames, but in other respects they are very like the American pattern. They have link motion, with rocking shaft; pony truck of Pennsylvania Railroad pattern; diamond truck with Raoul journal boxes; steam brake of pattern of American Brake Co., etc. Many details, again, are European, as the iron cab, wrought-iron wheels, etc. The principal dimensions of the engines are inclosed.

C. A. ENGSTRÖM,

Mechanical Engineer of Uleaborg Line, Finland State Railways.

Our correspondent incloses two photographs, one showing a Forney type and the other a Mogul engine. The accompanying engraving represents the latter engine, which is of the following dimensions:

DIMENSIONS OF LIGHT MOGUL ENGINE, FINLAND STATE RAILWAYS (ULEABORG LINE).

Cylinders.....	15 in. x 20 in.
Drivers, dia.....	49 in.
Truck wheels, dia.....	31 in.
Tender wheels, dia.....	37 in.
Weight in working order.....	56,500 lbs.
" " on drivers.....	47,000 lbs.
" " truck.....	9,500 lbs.
Weight of tender with fuel and water.....	30,900 lbs.

Total heating surface (external).....	739 sq. ft.
Grate area.....	11.8 sq. ft.
Boiler pressure.....	150 lbs.
Tank capacity.....	1,200 gals.
Fuel.....	Wood
Gauge of road.....	5 ft. 0 in.

The pilot is of steel. The boiler is covered with a layer of asbestos sheeting underneath the ordinary wood lagging. The connecting and coupling rods are made of steel. The cab is of iron, with a wooden roof.

The specification states that the materials used must undergo the following tests:

	Lbs. per sq. in.	Elongation per cent.
Boiler plates (lengthwise).....	54,000	20
" (crosswise).....	51,000	15
Rivet and stay iron.....	54,000	20
Copper fire-box and stay bolts.....	28,500	35
Bessemer steel ax'es.....	71,000	20
" tires.....	85,000	15
Crucible steel crank pins.....	90,000	15
" springs (hardened).....	140,000	.....

The engines are an interesting example of design, and it is somewhat remarkable that Switzerland, possessing neither coal nor iron mines, and situated a considerable distance inland, should be able to export locomotives to Russia, which has abundance of coal and iron, and has, moreover, a protective tariff.

Some correspondence has already appeared in these columns regarding the most northerly railroad in the world. The line from Lulea to Ofoten, mentioned above, running from the head of the Gulf of Bothnia across Lapland to the Atlantic, may fairly claim this title, as when completed it will reach a point 1,200 miles north of the most northerly railroad in Canada, and be partly situated within the Arctic circle. The engine we now illustrate is to work in latitude 65°, or about 1,000 miles farther north than any portion of the Canadian Pacific. Nearly the whole of the railroads of Great Britain, and most of the lines in Belgium, North Germany and Russia, are north of the Canadian Pacific, which reaches a higher latitude than any other Canadian line.

Send a Man to Europe!

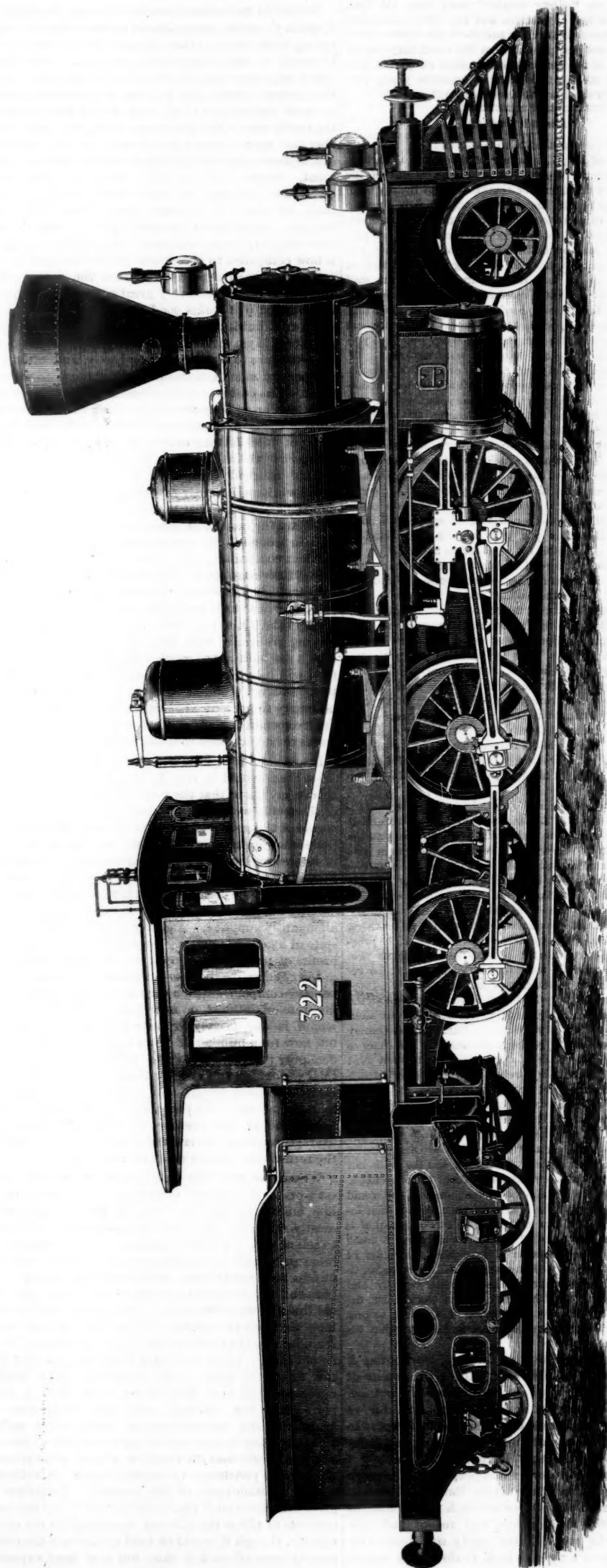
ILLINOIS, June 27, 1886.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I am not an Anglo-maniac, and hope your readers will give me the credit of being a thorough American, notwithstanding I may develop some apparent enthusiasm for trans-Atlantic ideas. For your editorial of June 18 shows so plainly that the very things we lack can be easily and certainly found in real life in Europe, that I cannot refrain from trying to get you to urge some of your wealthy eastern superintendents to go or send for or get up a committee to go and bring home a shipload or two of them. You have indeed struck the key-note when you say that the record of employees' qualifications should be kept by immediate superiors who know the men intimately, the desideratum just now is to sound this key-note so loudly and repeatedly that "the deaf shall hear." In saying that the men should be known intimately you only say what is true of many other of the responsibilities the manager is charged with. Intimate knowledge of what you are using or working with is always a prime necessity, and the lack of it is a drawback which may almost be said to be universal in some departments of railroad work.

It cannot be denied that Europeans, either from their longer experience or contracted environment, or some cause, have learned to study details and apply correct principles to what we call petty operations very much better than we do; in fact, nobody thinks of denying it. The most we can say in justification of our way is to assume a lofty attitude and poke fun at them for pottering with unimportant matters that are beneath the notice of broad-minded Americans who bear up the destinies of the most enterprising (and most reckless?) nation on the globe. But we are slowly growing, and throwing aside our crude Western notions; and, in fact, have already in some departments virtually adopted European ways of dealing with details, either by learning from them, or by parallel inventions here; and, so far as we have tried, we know that these methods are not only sensible but profitable, and this knowledge ought to warrant us in looking still further into their habits.

Our higher officers do sail across the pond to some extent, to be sure—President Bliss, of the Boston & Albany, I see has just gone—but the matters that exercise their minds of course totally unfit them for investigation of details, even if they were inclined to do it or could afford the time. But why shouldn't they send over some of their bright subordinates? No great benefit will ever accrue to the railroads if their officers always wait till they are superannuated or out of health before they take time to look about them. Let the stockholders encourage (financially) their younger officials to retire from active life (at home) for a season before amassing a fortune (or trying to), and see if by taking a little time to study they will, on resuming work, not only pile up the fortune faster but increase the wealth of the employer with much greater certainty. Superintendents, masters of transportation and train dispatchers who are well acquainted with the French and German languages are probably not so very plenty, and might not be easily found at first; but they can be evolved very readily when wanted; and indeed could profitably be trained even at considerable expense of time rather than to go on forever in ignorance of the details of nearly everything that is done on the Continent. I am not unmindful that Charles Paine and other master minds have been over there, and have told us many things they saw, but that does not militate against the proposition that a serious and close study of methods and habits, on the ground and by an American, would be profitable; and I venture to say that such men as Mr. Paine would be the first to approve of half a dozen smart division superintendents being



LIGHT MOGUEL ENGINE—FINLAND STATE RAILROAD (ULEABORG LINE).
Designed by C. A. ENGSTROM; built by the SWISS LOCOMOTIVE WORKS, Winterthur, Switzerland.

sent over, say by the Time Convention, for a stay of six months or longer.

Moral delinquencies are, indeed, the toughest feature of the problem; the very best men, according to the technical tests, will deliberately neglect to do as well as they know how, and thus discourage the bravest organizer. I therefore nominate, to be left at home, all those officers who are tainted with selfishness, vanity or narrowness. Men of high moral purpose should be sent, so that they will view the situation right end uppermost.

S. GOODNOW.

It really seems remarkable that there should have been no serious study of European railroad methods in detail by American experts, hundreds of whom have visited Europe. There has been some study of methods of construction and apparatus, which is precisely what we can learn best without going to Europe, owing to the fullness of the engineering journals and other publications. The casual observer, doubtless, is discouraged from making a thorough study, because at almost the first glance he sees that, on the Continent especially, an immensely greater force is employed to do a given amount of work than is required in this country. The conclusion is, therefore, that, whatever the defects of our system, it still succeeds in getting, on the average, more effective employees than the European systems. That may be and yet there may be much to learn from European practice. There we know that great numbers of men are employed to do things which we do not do at all. Moreover, certain fixed rules become necessary in a great administration, like those of most of our railroads now, that were not required when a railroad employed scarcely more men than a large factory, and they could be matched pretty closely by its manager.

It is, however, noticeable that Continental railroad men who study English railroads, as very many of them do, without exception express the greatest admiration for the efficiency of railroad employees there, who generally enter the service as boys and apparently "come up" very much as men do here, depending on the good impression they happen to make on their superiors, and without any well-defined qualifications (except in the minds of the railroad officers) for the different grades in the service. We have only this week a little book on the operation of English railroads by an officer of the Austrian State Railroads in which he remarks the great rapidity and skill with which the English employees do their work, and ascribes partly to the fact that they usually begin service in their youth and are kept at the same kinds of work, and he mentions as a draw-back that this makes them of little use outside of their specialty. Another cause of their efficiency, he says, is that their instructions are "models of simplicity and clearness: every employee knows exactly what he must do and what he must not do in the place assigned to him." Still, there is doubtless much to learn from European railroad administration, though there may be little for us to imitate directly.—EDITOR RAILROAD GAZETTE.]

The Freight Brake Tests.

NEW YORK, June 30, 1886.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I have noticed with great interest the complete and elaborate preparations which have been made by the able Committee on Automatic Freight Car Brakes of the National Car-Builders' Association for the approaching tests at Burlington, Iowa, on the Chicago, Burlington & Quincy Railroad, next month, and the eminent fairness which they are certainly aiming to show to all competing brakes; but there are a few points which they have evidently overlooked which would undoubtedly prove quite interesting to all railroad men.

First. They do not appear to have provided in their programme for any comparative stops to be made between the different power brakes and the present mode of controlling trains, viz., hand brakes. Now, as it is only by comparisons that we can determine the superiority of any claimed improvement, I would suggest to the Committee the propriety of going through with all the tests that are prescribed for the power brakes, first with a crew of brakemen such as would be habitually employed upon a similar train in ordinary service, out on the train awaiting a signal from the engineer to apply brakes when going down the grades; and second, with the same crew and the same train upon a level track, the crew in the caboose and not expecting a sudden call for brakes, as you well know is most frequently the case at night or in severe weather. As the conditions of train, track, speed, etc., will be alike, it seems to me that the time is most opportune for determining what is the relative advantage with any or all of the power brakes over the present means in use for stopping freight trains.

Second. Condition No. 5 of the Committee's schedule provides that the engines to be employed in the tests shall be of the eight-wheeler class and have 17x24 cylinders, with a weight of not less than 51,000 lbs. upon the drivers.

Now I would suggest that while such an engine might answer on a road having the minimum quantity and quality of grades, it is not the class of engine that would habitually be used with 50-car trains upon roads having grades of 52.8

ft. per mile. While it might make little difference with those power brakes which obtain their source of power from an independent mechanism, it would seem to be unfair to the compression brakes which derive their power from the resistance offered at the head of the train, in compelling them to use an engine of a class which would hardly be employed with a 50-car train upon a road having such grades.

I would, therefore, suggest to the Committee the desirability of making a few tests, of a supplementary character should it be deemed best, with a Consolidation engine, to give them an opportunity of determining what difference there would be in actual service between handling such a train with a light engine and a heavy one.

Too much praise cannot be given the Committee for the thorough and impartial manner in which they have thus far acted in preparing for these tests, and for the great amount of thought and labor which they are giving to the subject.

The test is one of great magnitude, but the Committee seem to be fully equal to the occasion.

EDWARD VERNON.

Some Defects of Car-Couplers.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Supplementary to your comments on the New York state car-coupler trials in the current issue of the *Gazette*, permit me to suggest one or two points of importance which seem to have been overlooked in most of the devices exhibited at East Albany.

One requirement in a desirable coupler is that no part of the operating "rigging" shall come above the floor of a platform car. If it does, it is liable to be broken in loading long timber, bridge iron, etc., which extend over more than one car, or by the shifting of any load on the car which may not be properly secured. None of the couplers at East Albany were on platform cars, and few were so arranged that they would not come above the floor of such a car. Some would require extensive, if not radical, modification to meet this requirement.

The best place for the handles of the patent couplers does not appear to receive due consideration. How many cars can one find in any yard with sides scraped, corners mashed or sill steps bent by running too close to other cars on sidings? And yet almost all of the East Albany exhibits had the working levers so exposed that a little mishap of this sort would surely bend or break them and thereby render the device inoperative. Underneath the sill is perhaps the safest place for a handle, though it is not so easily found as one outside of the car. Some of the couplers referred to had handles so placed and one or two had them just inside and at the end of the car body. Some of them had handles so close to the body of the car as to rasp the knuckles of the operator, as the hands of the yardman who did the coupling at East Albany will show.

At the present rate of progress in the development of patent couplers, the thought occurs that it will not be long before an applicant for the position of trainman will have to take a preparatory course in a "School of Instruction in Patent Couplers," or perhaps supply himself with a pocket "Key to Couplers" in order to know what to do with the various devices he will have to deal with. Imagine a trainman, old and experienced in his business, but unacquainted with these "new-fangled" devices, helping to make up a train on a dark night in a yard full of cars equipped with various kinds of "safety" couplers. He don't know the peculiarities of the things, and has neither the time nor light to study the ingenious and mystifying combination of cam, lever, dog and ratchet. The shortest way for him to do is to refer to his "Key" when he gets stuck. He has to make a connection, say, between a couple of Archer couplers, and does not find a link in either draw-head. His guide directs him to "go to the side of the car and find a lever. If not found on one side go to the other. Pull it down as far as you can and push into a notch to hold it down. Then go around and put link into draw-head, come back and release lever and look out for yourself when it flies up. The car is now ready to couple, and the link will go into most draw-heads without guiding by hand." Pretty soon he comes perhaps to a McKen coupler, and his "Key" tells him to "look for a handle alongside of car—either side. Pull handle down to lift pin and up to raise link. Pull down and push in to set not to couple, or if that don't work, pull down and out." Next, maybe, he strikes a Robinson and finds he must "look for handle under sill near end of car. Pull handle up to lift pin and down to raise link. To set not to couple, pull handle up and push in or pull out, whichever you can do." Then he runs across a Hien. "If you want to couple, see that the jaws on both cars are open. If either is closed, go between the cars and pull it open." He also finds that in order to couple with any other kind of coupler he must use a pin and link, guiding the latter by hand. Bye-and-bye comes, say, a couple of Ames to be uncoupled. "Find which link is underneath, and pull down on the handle alongside of that car. Don't try to uncouple unless the coupling is slack, and don't get hold of the wrong handle. If you do, be careful that it don't throw you when it flies up." At length our trainman finds it necessary to couple an ordinary, old style draw-head to a vertical plane coupler of the Miller type—say, a Cowell or a Titus & Boesinger. He knows he must guide the link by hand into a slot in the head of the patent coupler, but his "Key" does not tell him, or perhaps, he forgets the caution, not to get on the right hand side of his own draw-head as he approaches the other. The cars come together with a pretty sharp "bump." The vertical plane draw-head does not strike exactly square against the other, but is forced by it on the right-hand side.

The poor trainman is caught and crushed, and before his body is cold there are a dozen applicants for his place.

Mr. Editor, the "safety coupler" laws have all been enacted from the best of motives, and the officers intrusted with their enforcement are most zealous in the effort to save life. But is it not just possible that the result may remind us of the fable of the kind-hearted elephant who, wishing to act as a foster mother to a brood of homeless young partridges, carefully sat down on them to keep them warm?

Railroad Reports.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of May 7, speaking of the Chicago, Burlington & Quincy annual report, you say that it is one of the least satisfactory documents of the kind issued by any management of high reputation, on the grounds that it gives no information of value concerning traffic—nothing but numbers of passengers and tons carried—no ton mileage, no passenger mileage and no train mileage, nothing whatever to enable one to compare the cost of doing work with that on other railroads or on that railroad in different years, and nothing to show the rates received for work done. The italics are mine, because as a merchant and shipper, and a diligent reader of your paper, that struck me as the point where silence may be gold to the company, but weighs as heavy as lead on the minds of the merchant and manufacturer.

Presumably the bulk of your readers are railroad people and stockholders, who are supposed to more clearly understand these published reports than the laity, but for all that it seems evident that the Chicago, Burlington & Quincy report meant to leave them, too, in the dark on certain essential points as much as possible. As to the proprietor of the road, the stockholder, if the business which gives the earnings is kept a secret from him, as you say, it is because he does not care. He receives the earnings, he does not pay them. The secret, therefore, is not kept from him, but from the manufacturer, the merchant and the consumer, out of whose pockets those earnings flow. Hence, as you truly remark, "this kind of report is chiefly remarkable for what it does not tell."

That the profits of this road, satisfactory as they are, are not as ample as in former years, is of course traceable to various causes. One of the leading causes, strange to say, appears to be least known or understood, and consequently is never referred to, and that is the granger movement. This abortive attempt at improvement acted like a two-edged sword: it cut both ways. The fierce zeal of the grangers, assisted by bungling legislatures, starved and crushed new roads, which then fell into the hands of such roads as the Chicago, Burlington & Quincy and other mammoth corporations, and, though bought in for a song, absorbed part of the big roads' earnings, and in many cases proved very elephants on their hands. This, while it reduced the average profits of the road, left the grangers to cope with one powerful antagonist, who then made it his object in life to "sit down" on the granger.

To a certain extent the modern controversy between railroads and the Knights of Labor has a similar bearing, and it behooves all thinking men, and especially such papers as the *Railroad Gazette*, to observe and study this movement with much care and an unbiased mind. Since it is an acknowledged truism that there is not and must not be any war between capital and labor, they being two brothers who have need of each other; but since, at the same time, there evidently seems to be a fierce quarrel between the two brothers, it is the duty of the philosopher, and the interest of the practical man, to remember that there is no smoke without fire, and that all causes which tend to kindle fires must be removed, if we wish to be safe from a conflagration.

These remarks naturally lead back to your criticism of the Chicago, Burlington & Quincy report, and the omissions therein referred to. "As the Chicago, Burlington & Quincy stockholders," you say, "get large dividends in bad times as well as good, and as their company does well when most other companies do ill, they probably rarely ask for what is not told them, especially as they know they have an entirely trustworthy as well as an exceptionally capable set of men in charge of their affairs." Granted. But blind faith has led nations as well as stockholders to grief before this. The Chicago, Burlington & Quincy stockholders are undoubtedly told the truth in those reports, and nothing but the truth, but they have never yet been told the whole truth. Labor troubles, or possible labor troubles, are never even hinted at, and would not be if they had any; the source of earnings, or their increase or decrease, is never explained; no sort of mention is made why the road is satisfied poking along over so much single track; and the extension of branches, absorption of other roads, etc., are only communicated because it cannot be helped. As in a household even the most trustworthy and capable servants need looking after, so the stockholder, the proprietor of the Chicago, Burlington & Quincy, or any other railroad, owes it to himself to know exactly what his servants are doing.

[We did not criticize the Chicago, Burlington & Quincy report for its failure to inform the public of its rates or anything else, not because we do not believe the public is entitled to such information, for we do, but because the public does not look to a report to stockholders for such information, and in the states on the lines of the Chicago, Burlington & Quincy it has other sources of information, prepared by its own agents, in the reports of the State Railroad Commissioners, whose duty it is to secure such information as may be of service to the public, and record and publish it. But the stockholders rarely see these state reports, and have a right to look to their own agents

and employés—to the directors and officers of their company—for all desirable information.

We fail to understand how the Chicago, Burlington & Quincy's profits were reduced by the failure of competing roads which it then bought for less than cost. Certainly if these roads had succeeded (which they could only have done by earning more than they do in the Chicago, Burlington & Quincy's possession, if they are now unprofitable to it), they would have reduced the traffic which the Burlington now gets, and probably still more reduced its profits; for the business can be more economically conducted by one management, which can do the work on the line on which it can be done most economically, than by two. It is true, very likely, that the company would make greater profits if some of the lines which it works had never been built; that is, it is now compelled to give much greater services to the community than it used to give for the same profit. But this is the fate of every great company in a growing country, if it makes good profits. It might like to stand still, but it can't. Wherever there is a fair prospect for a paying traffic for a new branch or line, one is pretty sure to be built by somebody, and often the prospect of much less traffic than enough to pay interest on its cost secures its construction, because the line may bring to some other road, which now has none of the traffic, business which it will carry hundreds of miles farther over roads already built. The prospect of the loss of such traffic is constantly compelling railroad companies to build or buy railroads which will hardly add anything to their profits; and the knowledge that they are often so compelled to secure the control of lines has a tremendous influence in securing the construction of lines by independent companies. Those who invest in them reason that if their road should not succeed in making good net earnings, it can spoil so much for the great company in whose territory it lies, that that company will finally take it and pay for it. In this way, Iowa is becoming gridironed with railroads, a very large part of which are built not so much with the expectation that they will increase the profits of the great companies that construct them, as with the belief that they are necessary to prevent a reduction of its profits; these are "expenditures of capital for defense," of which we have had occasion to speak more than once.

It seemed a few years ago that in some parts of the West there would be very little railroad construction thenceforth, and that the chief result of the growth of the traffic would be a reduction of rates or an increase of the profits of those lines which were earning little interest on their cost. But the fall in the rate of interest of late years has had among other effects this, that a smaller territory will support a mile of railroad, and the meshes of the railroad network consequently are growing smaller in districts which seemed abundantly supplied. And this work is being done in spite of a general tendency toward the reduction of the profits of prosperous companies. Scarcely anywhere in the country are there so many very prosperous companies—companies which earn more than the prevailing rate of interest on money—as west of Chicago, which is due largely to their low capital accounts; but now for a number of years these profits have been declining; they have to add millions every year to their capital expenditures without any corresponding increase in their profits, and sometimes without any increase at all. The probability is that their profits finally will, on the average, be no greater than the average profits of other capital investments on which the returns are equally safe and regular.

We can see how this reduction in the rate of interest works. A company is making good profits on a line built long ago at a cost of \$50,000 per mile, mostly raised by 7 per cent. bonds—at that time hard to sell at par. Another company, part of whose system can be used for a line to the same places, can now build a road for \$40,000, and borrow the money at 4 per cent. If it can get half the traffic that pays the old line a profit of \$3,500 per mile (or more), it can more than pay the interest on the cost of the new road, besides the profit on the traffic so secured over its old road. Lines are being built this year that for the first few years (till improved after traffic develops) will cost little more than \$500 a mile per year for interest, and this cheapness is leading to the construction of hundreds of miles painfully close to lines which require \$1,000, \$1,200 or so for interest; and the result of all this is to reduce the average percentage of interest earned on railroad capital in such parts of the country. Doubtless a great deal more such road is built than is for the best interests of either the railroad companies or the community, though it would be hard to convince the community most affected of this; but it at least explains

why the profits of many railroad companies have been growing so much more slowly than their capital. It is, of course, unfortunate for stockholders, but they cannot expect permanently and on the average to get a higher rate of interest than is commanded by other investments with similar risks. Taking the country as a whole, they do not now, doubtless; but it is not probable that in any considerable territory exceptional profits will last long.—EDITOR RAILROAD GAZETTE.]

Piece Work.

I.

IS THE SYSTEM APPLICABLE TO RAILROAD SHOPS?

It is, beyond any doubt.

The title of this paper and the answer to it will, in all probability, cause many who happen to read it to dismiss the subject at once, without further investigation, as so much waste of valuable time.

I am aware that many able heads of railroad shops consider this subject utopian. It is granted, generally, that the contract system is applicable to the manufacture of new parts of new engines, and profitable in individual shops. It may be conceded by some, also, that it might be even introduced in similar cases in railroad shops, and successfully carried out if sufficient new work is to be done, and the operatives do not require to be shifted from new to old work or repairs. Few are ready to admit the possibility of doing repairs to engines or cars under the piece-work system.

The objections advanced are of various kinds.

1st. The difficulty of adjusting a reliable schedule of prices to the different operations on the different parts, which seems to be enhanced by the varying nature and extent of repairs required by similar parts.

2d. The great variety of repair jobs which a railroad mechanic is required to engage in each day, from which follows the difficulty of keeping individual account of his operations.

3d. The increased cost of clerical force required to properly record both the operations and the cost.

4th. The danger of turning out bad work, by a dishonest employé, who might be induced to slight it in order to increase his gains.

5th. The time which a foreman must necessarily give to a close scrutiny of the work of each individual employé cannot be spared for that purpose.

These are the principal objections generally made to that much dreaded system.

An additional objection is occasionally made in this way, and may as well be noticed: "I have as good a system in my shop as is in practice in any other shop; my men do as much work as men do in other shops; my shops are as well and economically managed as those of any other railroad, and perhaps better." To this class I do not address myself. The world begins and ends within the narrow limits of their shop walls. They know it all.

To those who are willing to give the subject an impartial and careful hearing, it is proposed to show that piece, or contract work, can be applied to railroad work, both in repairs of cars and locomotives. That the system is profitable and fair. It is proposed, also, to consider the objections usually made against contract work, to show their fallacy by practical illustration of the details and methods required to introduce and maintain the system.

The first objection to be considered is the difficulty of forming a schedule of prices.

That this can only be done at the expense of much time and labor is granted. Who is to give the necessary time and thought to procuring the information required? Who is most interested? Surely, the person who is responsible for the management of the shop; and next to him, the foreman of the various departments. The latter are supposed to be perfectly familiar with the details of the work. It will hardly be disputed that a foreman is worthy of the name and position only when he is fully conversant with the work under his charge, in its fullest detail. Surely, no employer would be satisfied to trust his business, involving the outlay of thousands of dollars, to a man who could not satisfactorily account for the expenditure of his money. A foreman's greatest responsibility is that relating to the expense of his shop, to properly discharge which he must bend his energies toward economy both in labor expended on the products of his shop, and in the use of material required for the same. His efficiency will be measured by the cost of the work done. If it is no greater than it ought to be, he is a good foreman and a good manager. To prove his efficiency he must convince, at least himself, if his employer does not put him to that test, that he has reached that degree of excellence which he is supposed to possess. To satisfy himself upon the efficiency of his management he must scrutinize closely the nature of the work, as well as its progress, and assure himself that the time spent by an employé upon his job is no more than it should be, and this he must do in the case of each and every workman under his charge. Assuming that he is a good manager, he possesses the information necessary to fix a schedule of prices. He knows that a certain piece of work will require the labor of one man a certain number of hours, and the rate of pay per hour being fixed, the cost of that particular job is settled upon for all similar cases in future. Therefore the establishment of fixed prices for all new parts, at least, cannot be an impossibility if an attempt to get the necessary information is earnestly made. The difficulty of establishing prices for repairs to machinery of locomotives is not so great as it may appear to be. It is true that the wear of parts is greater in some cases than in

others. In many instances, however, this fact would have but little influence, if any, upon the cost of repairs. Let this be illustrated by a job of boring two cylinders, one of which is worn $\frac{1}{4}$ -in. more than the other. Each will require in all probability two cuts, and the time required to bore that which is less worn will hardly be shorter than the other. The determination of a fair average price for this kind of work will be found applicable to all similar operations. The same method of obtaining prices can be extended to any other parts, and will not fail, provided that degree of attention is given to each individual operation which a good foreman is supposed to exercise.

The second objection made to the system is the difficulty of intelligently recording the numerous operations which a workman is necessarily called upon to perform in repair work. There can be no doubt of the existence of that difficulty. But, does it follow that we must lose sight of these operations because they are short and apparently unimportant? There is no service too trifling to receive attention where money is paid for its performance. This seemingly trifling work requires greater supervision than that of greater magnitude. A mechanic will give constant attention to and take great interest in finishing a fine piece of machinery, because its importance demands his best effort, and his reputation as a workman is at stake. If he is engaged in unimportant work, it is likely to drag along as work of a routine character. Often more time is lost in preparing to do a small job than it will take to complete it. The money equivalent of such delays is an important item of loss to the employer. Hence the necessity of close attention to trifling jobs done under any system. It is, therefore, very evident that the foreman cannot employ his time in a manner more profitable to his employer than in ascertaining the cost of unimportant work. The greater the difficulty to reach that end, the greater should be his effort to overcome it. Since the necessity for this course exists under either piece work or the day system, the objection raised is not well founded.

The third objection is based upon the theory that an increase in the clerical force will make the system unprofitable. The expense from that source is not as great as may be supposed. To many persons a foreman's clerk appears an unwarrantable luxury. In shops where say 60 to 80 men are under the supervision of a foreman a certain amount of clerical work has to be done by him, in writing orders for material, and keeping records of the cost of certain classes of work along with other routine correspondence between one foreman and another, and from his shop to the office. His time is often taken up in trips to the office or other shops in search of information pertaining to his work. He will spend time in hunting up material in storehouse or elsewhere. What takes place in his shop during these intervals? His men, under the day-work system, quickly discover his absence. Numbers of the less conscientious class will at once take a "lay off" and await his return before resuming operations. It is safe to say that the money lost to the company by this "soldiering" indulged in during the absence of the foreman while he is performing messenger service would pay the wages of a messenger boy, and a clerk or two besides. Under any system, it is a mistake to divert the foreman's attention from his men. His presence in the shop is necessary at all times. If not, why have him there at all? But, after all, has not every foreman some one in his shop, acting as a messenger, or clerk, or helper—call him by what name you choose? Let a master-mechanic look closely into the personnel of the shop, and I venture to say that he will not fail to find a general utility man acting in the above capacity, but who lacks a clerk's ability, and is quite as expensive as the latter would be. Give this man work suited to his capability, and put in his place a young man who can do the clerical and other work which the foreman is obliged to do in addition. You will save money in the end, and have some one to keep the proper record of piece-work without any increase in your expenses.

Next we come to the consideration of the objection made to the system, because of the probable tendency to turn out bad work. That will be the result if it is permitted. Such cannot be the case, however, if proper safeguards are provided. It must be conceded, that under any system the quality as well as the quantity of the work must be controlled by some one. In a shop employing a large number of workmen, say 50 to 100, natural divisions of the force already exist. It is practically cut up into gangs, and some one in each gang directs its operations, subject to the general supervision of the foreman. This sub-foreman is generally held accountable for the proper management of the men under him, and his responsibility extends so far as to embrace, not only the distribution of the work among his men, but also the supervision of it, so far as quality and quantity are concerned. We need, therefore, go no further, admitting the efficiency of the gang-foreman, to provide a sufficient check upon the quality of the work done. He is in charge for that very purpose. If he does his duty the possibilities of slighting work cannot be greater under one system than another. There is, however, another very efficient safeguard against that evil, and that is the knowledge that a workman has of his individual responsibility for the proper performance of his contract. He agrees to do good work for a stipulated price, and if he violates his contract in any way, he has no reason to complain if his compensation is withheld until he has fulfilled his part of the agreement to the letter. The condition of the contract requires that the work shall be well done. If he fails, and the work must be gone over again, this failure may be the source of serious loss to him. Of course he will only be paid the amount agreed upon, regardless of the time required to make good what he has done badly or neglected in the first place. A workman will soon find that it is not to his interest to do bad work. He works for money, and will not expose himself to pecuniary

loss, if he has any idea that his shortcomings are likely to be discovered.

The fifth objection, viz., that the foreman cannot spare time enough to follow individual operations, has practically been already answered, and scarcely needs any further consideration. It has been shown, that it is not only desirable, but absolutely essential, that he should give his time and attention to just that part of his work. Again, if not put in charge of work to secure its performance cheaply and well, what is he in charge of it for? If for that purpose, how can he secure the desired end except by systematic investigation of the cost of individual operations? which, when summed up, form the total cost of labor expended upon individual parts. It is not sufficient that he know the cost of a given piece of work to be right to-day, and lose sight of it in future. He must, by continuous observation and comparison, see that the same job is as quickly and well performed each time it is repeated; for, if he fail to do that, he cannot assure himself, or assert that, to his certain knowledge, the cost of similar work is the same in all cases.

If a foreman acquits himself of his duties in the manner I have pointed out, his position is indeed a very laborious and trying one. Can a system be devised which will diminish his labor in that direction and yet leave him proof that the cost of his work is the same to-day that it will be to-morrow, or a month hence? We answer, nothing except the piece-work or contract system. Let him follow the suggestions and hints I have pointed out, and work earnestly for two or three months a year, if necessary, with the settled determination that he is going to find out, if he does not already know, what it costs the company, under his management, to manufacture each part of a locomotive or car. Let him make a note of the cost of each operation on each of these parts. Do a little of that kind of work each day, and he will soon be in a position to make the schedule of prices he requires, and be able to say to a workman: "This job is worth so much money." Furthermore, when it is completed he knows that it costs no more than the figures he has named, no matter by whom done or when. Is it not evident that such a system would be a source of great mental comfort to employer, foreman and faithful employé as well?

Speaking from experience, I can assure all parties interested that the accomplishment of that end is well worth all the trouble it necessarily entails. It will pay in more ways than one, as I hope to show in a future paper.

F. D. CASANAVE.

Corrugated Metal Tubes.

Engineers have long known the advantages to be obtained by the use of corrugated tubes in securing additional strength without increased weight of metal, and in providing a tube which will permit of expansion and contraction without injury to its connections. It has been, however, difficult or impossible to obtain such tubes of good quality and even thickness at a cost which would permit of their general use.

The Wainwright Manufacturing Co., of No. 65 Oliver street, Boston, has recently secured a process of corrugating by which, it is claimed, corrugated tubes of uniform thickness and even quality can be manufactured in iron, brass, copper and other metals, and is now placing these tubes on the market, from its factory at Medford, Mass., which is provided with the necessary machinery for making tubes for boiler flues, heaters, condensers and all similar purposes.

The advantages claimed for these tubes are greater strength without increased weight of metal; longitudinal flexibility, permitting expansion and contraction; comparative freedom from incrustation or scale, and a large increase in heating surface over a plain tube, combined with a certain effect in retarding the passage of gases, which should be an advantage in boiler tubes.

The tubes as made can be left plain at the ends, or at any part of their length, as may be desired to fit them for any special use.

New Passenger Cars on the New York Central & Hudson River.

The West Albany shops of the New York Central & Hudson River Railroad have just turned out a train which is an excellent example of the latest practice in passenger car construction. The train consists of a baggage car, a smoking car and three passenger cars, and was this week put in service on the Hudson River Division, running a local express train between New York and Poughkeepsie.

The interior finish of the cars is attractive to the eye from its simplicity and elegance. It is entirely in hard wood, polished, and of a color light enough to give the cars a cheerful appearance, and at the same time to avoid an undue glare of light, the head-linings being also of wood, paneled and free from paint, with no other decoration than the simple moldings dividing the panels. The windows are large and are placed somewhat lower than usual, bringing the window seat to a point on which the arm can conveniently rest. They are provided with spring curtains of dark material, bordered at the bottom with leather, which can be adjusted at any point desired.

Each car has at one end a closet for gentlemen and another closed box or closet in which the Baker heater is entirely inclosed. This closet is lined with sheet zinc, and is closed in front with doors of iron lattice-work, so that the heater can be seen from the front, while entirely shut off from the car. At the other end there is on one side a ladies' closet and on the opposite side a wash-room, provided with wash-basin towels and other toilet conveniences, which must be appreciated especially by ladies traveling on a dusty day. The smoking car is the same in all respects as the other cars, except that

the seats are upholstered in leather instead of plush, and it is provided with only one closet, and has no wash-room.

These cars are provided with Mr. M. N. Forney's improved car-seat, the comfort and convenience of which are fully appreciated by the travelers who use the train.

The cars are painted outside a dark wine-color or Tuscan red. This color, by the way, has been adopted by this company as its standard, and all the passenger cars are receiving it as fast as they come into the shops. The company has for many years adhered to a light yellow, and has not until lately decided that the darker color is preferable for its wearing qualities and for the better appearance which the cars present in service.

The cars are mounted on trucks of the New York Central pattern. The wheels are 36 in. in diameter, with steel tires and wrought-iron centres, made by the Patent Shaft & Axle-tree Co., of Wednesbury, England.

The company has begun the work of replacing the old cars in its local service, which have not been remarkable for their comfort or convenience, and if the train described is a fair specimen of those which are to follow, the patrons of the road should be well satisfied.

A Vanderbilt House for Railroad Employees.

The directors of the New York Central & Hudson River Company, at a meeting held June 30, adopted resolutions accepting the offer made by Mr. Cornelius Vanderbilt, in the letter given below. It is understood that plans are ready and work will be begun on the building at once. Mr. Vanderbilt's letter is as follows:

"General Superintendent Toucey reports that the plot of ground in the depot yard, at the corner of Madison avenue and Forty-fifth street, is not available for railroad purposes because it cannot be reached by the tracks for storing cars. It seems, therefore, that it can be very properly dedicated to the use, enjoyment and improvement of the employees of the company. As a business proposition I think no better use can be made of it. It has been for many years the policy of the company to encourage, at different points on its lines, efforts looking to the comfort and welfare of the men. These experiments have been very successful and have fostered and promoted good feeling, better service and general recognition of common interest in the work of the company. At this central point, where so many employees congregate, and where any action is representative in its character and has far-reaching influence, I would like something done which will show in a marked way the personal and constant care of the management in all matters which will interest and benefit those engaged in every department of the company's service.

"I have had plans prepared for a building, 80 ft. front by 40 ft. in depth, to be used for the benefit of railroad men in the service of the companies centering at the Grand Central Depot. It will be a substantial structure, with bath-rooms, gymnasium and bowling alleys in the basement; reading room, library, room for games and offices on the first floor; a large hall for general meetings and rooms for classes on the second floor, and rooms for janitor's family and sleeping rooms for men coming in late or detained in the city over night in the upper story. I wish you to lay before the board of directors this proposition: If the company will set apart the land at the corner of Madison avenue and Forty-fifth street (40 ft. on the street by 80 ft. on the avenue) for the uses and purposes for which such a building would be erected, I will bear all the expenses of construction and of fitting and furnishing it ready for use. I would suggest that a lease be made of this land to seven trustees and their successors in the trust. The lease should be upon the condition that the land and building be for the benefit, enjoyment and instruction of the employees of the New York Central & Hudson River Railroad Co. and its leased and affiliated lines, of the New York & Harlem, and of the New York, New Haven & Hartford Railroad Co., and of such other companies as may be entitled to use the Grand Central Depot. It would be proper for the company to provide in this lease that it may be terminated at any time upon reasonable notice by the company, and upon the payment to the trustees of a sum sufficient to acquire another site and place upon it a structure equally good."

Foreign Technical Notes.

It appears that while the use of steel tires has been growing in favor with us, there are signs of a reaction in Germany in favor of chilled wheels.

These wheels have never lost favor so much in Austria as in Germany; and while the German statistics for 1884 showed only 1,819 chilled wheels in use, of which 0.38 per cent., or 7, had broken in that year, in Austria 170,000 were in use, without a single break in 1884.

The firm of Ganz & Co., of Buda-Pesth, state that out of 160,000 of their chilled wheels in use in Austria-Hungary, only six breaks have come to their knowledge in four years, and they offer their customers a ten-year guaranty on their wheels.

On the other hand the Prussian State Railroad management has recently issued orders which will virtually prohibit the running of cars with cast-iron wheels over its immense system.

In the latest trial of continuous brakes reported, that of the Westinghouse against the Schleifer compressed air brakes on the Bavarian State Railroad, April 12 and 13 last, as given by the *Journal* of the German Railroad Union, the Schleifer brake did not appear to any great advantage, being beaten at all points by the Westinghouse.

The points tested on the trial were:

1. The time and distance for a full stop on various grades.
2. The smoothness of braking.
3. The rapidity with which the brakes could be released.
4. The steadiness of the brake grip on long descents.

The Westinghouse train on the first day weighed 263 tons and the Schleifer train 253, on the second day the weights were, respectively, 195 and 179 tons.

The proportion of the braked to the unbraked weight of

train averaged 72.6 per cent. for the Westinghouse and 71.6 for the Schleifer train.

The first trial was made on a grade of 0.23 per cent. (12 ft. per mile). The stops made by the Westinghouse ranged from 268 ft. for a speed of 25 miles per hour to 426 ft. for a speed of 30 miles per hour.

The Schleifer stops were 262 ft. for a speed of 26 miles and 478 ft. for 30 miles.

The next trial was on a 0.75 per cent. grade (39½ ft. per mile), and resulted in stops of 344 ft. and 331 ft., at speeds respectively of 24 and 27 miles for the Westinghouse, and 669 and 826 ft. at speeds of 26 and 24 miles for the Schleifer.*

On the 13th, the first trial was on the 12 ft. per mile grade, and the Westinghouse stops ranged from 514 ft. at 39 miles to 587 ft. at 43 miles. The Schleifer range was from 547 ft. at 39 miles to 751 ft. at 41 miles.

On the same day trials on a grade of 1.41 per cent. (74 ft. per mile), gave stops for the Westinghouse of 544 and 498 ft. for speeds of 37½ and 37 miles, and for the Schleifer of 547 and 626 ft. for 34½ and 39 miles.

In order to test the quickness of action of the brakes repeated stops and starts were made on the 1.41 per cent. grade, with the result of three stops and starts for the Westinghouse in four minutes and four stops in 5¼ minutes; while three stops and starts with the Schleifer brake took 7¼ minutes.

The third test was made on uniformity of grip on grades of 1.22 to 1.41 per cent., with the result of very steady speed (not noted) on the part of the Westinghouse train and very irregular speeds of the Schleifer train, due to repeated failures to hold on the part of this brake. Another trial on this point, in which a speed of 24 to 28 miles per hour was to be maintained, showed the Schleifer to better advantage as to uniformity, as the speed varied only from 19 to 22 miles; while the Westinghouse ranged from 23½ to 28 miles; but it will be perceived that the Schleifer made no attempt to maintain—or at least did not succeed at all in maintaining—the prescribed speed, while the Westinghouse average was 26 miles, exactly as required.

Both brakes broke a number of couplings in coming to a stand in the course of the experiments, but the Westinghouse application was a long way ahead of the Schleifer in smoothness.

The trials were attended by quite a notable concourse of German, Swiss and Austrian railroad officials.

It appears that the Schleifer is similar to the Carpenter brake, with a supposed improvement in the shape of an escape valve which instantly empties the brake cylinders as soon as the pressure falls below 45 lbs. The presumable object of this attachment is to secure a very rapid release of the brakes. That it is not very efficient in so doing appears pretty clear from the trial testing the length of time for a given number of stops and starts. Its effect was most disastrous, as might have been expected, on the ability to hold the velocity of a train at any desired point, since the pressure has to be kept up to 45 lbs., or else the brakes must be allowed to go on and off in quick succession, with most undesirable effects on the steadiness of motion.

The Schleifer reservoir pressure was about 46 lbs. during the experiments, and the Westinghouse was kept as near as might be to 52 lbs., so as to put the apparatus nearly on a par with the Schleifer—the usual working pressure of the Bavarian Westinghouse apparatus being 60 to 67 lbs.

The experiments, therefore, certainly did not favor the Westinghouse brake, and it seems indeed a rather odd way to test brake apparatus to run it at a pressure for which its cylinders and other fittings were not proportioned.

The action of the Prussian state road management adopting the Carpenter brake instead of the Westinghouse—admitted by the government officials to be a better safety brake—has excited strong criticism in Germany, which is expressed in *Glaser's Annalen* of May 15 through a detailed arraignment by Herr Capteyn of the government policy in this respect.

TECHNICAL.

Locomotive Building.

The Boston & Albany shops in Springfield, Mass., have begun to build a new freight engine with 20 by 26 in. cylinders for the road.

The Baldwin Locomotive Works in Philadelphia are building several Mogul freight engines with 19 by 24 in. cylinders for the St. Louis, Alton & Terre Haute road.

The Rhode Island Locomotive Works in Providence have sold a light engine to the new White Plains & Augusta road in Georgia.

The Portland Co. in Portland, Me., has just delivered to the Maine Central road a new passenger engine with 17 by 24 in. cylinders and 68 in. drivers, and is building three more of the same size for the road. They are to run the Mt. Desert express trains.

The Buffalo, New York & Philadelphia shops have lately completed 3 new locomotives for the road.

The Rhode Island Locomotive Works in Providence have just finished a Mogul freight engine with 19 by 26 in. cylinders for the Cheshire Railroad.

The Car Shops.

We are informed that the Associated Press dispatches in relation to the fire at the works of the Missouri Car & Foundry Co. in St. Louis, on the night of June 18, were much exaggerated, the destruction by fire being only partial. The company is already rapidly rebuilding its shops, and expects to have them in partial running order by July 1, and to have the works all completed and running to their full capacity by August 1 next. The company has a number of orders on hand.

A new car wheel foundry is being built at East Buffalo, N. Y., the owners being Mr. Henry M. Brown, formerly General Superintendent of the Buffalo Car Wheel Works,

* Stops made as if at a station, which may possibly account for the inverted relation of runs to speeds.

and Mr. T. C. Dutro, of St. Louis. The works will be ready for business in a few weeks.

Bridge Notes.

The King Iron Bridge & Manufacturing Co. has enlarged its shops in Cleveland, O., fully one-third within the last two months to meet the growing demand of its business.

The Philadelphia Bridge Works of Crofode & Saylor at Pottstown, Pa., are to furnish the superstructure for the new Market street bridge in Philadelphia.

Iron and Steel.

The North Branch Steel Co., a new organization at Danville, Pa., has bought the iron works of Grove, Grier & Co. and is making extensive additions. The new company will make steel boiler plates, steel forgings and steel angle and shape iron.

Carnegie Brothers & Co., in Pittsburgh, are running their works on an order for 20,000 tons of steel rails for the Union Pacific road. They are also filling an order for 400 tons of bridge steel to go to Texas, and 1,300 tons of structural iron for Denver.

Dilworth, Porter & Co. are filling an order for 500 tons of spikes for the St. Paul, Minneapolis & Manitoba road.

The blast furnace of the Cleveland Rolling Mill Co., at Newburg, O., which has been rebuilt, will soon go into blast.

No. 2 stack of Sloss Furnace at Birmingham, Ala., has gone out of blast and is to be remodeled and rebuilt.

The Apollo Steel & Iron Co. has been organized in Pittsburgh with \$300,000 capital stock.

W. D. Wood & Co. at McKeesport, Pa., are building an addition to their forge department.

The Sequatchie Coal & Iron Co. has been organized for the purpose of building a blast furnace at South Pittsburgh, Tenn. The intention is to build two stacks, each of a capacity 700 tons weekly.

At the annual meeting of the Bethlehem Iron Co. in Bethlehem, Pa., last week, the old board of directors and the old officers were re-elected. The stockholders voted to authorize the placing of a mortgage of \$1,500,000 upon the property.

The workmen in nearly all the rolling mills in Philadelphia struck on June 29 for increase of pay, which mill owners say it is impossible to grant at the present prices of iron.

Manufacturing and Business.

John A. Roebling's Sons in Trenton, N. J., have taken the contract to furnish the wire ropes for a cable street railway in Melbourne, Australia.

The Penfield Block Co. in Lockport, N. Y., is running its truck department over time to fill a large order for platform 4-wheel trucks and 2-wheel barrows for the new Erie Express.

T. C. Snyder in Canton, O., is running his works full time on iron roofing for buildings and cars. He has recently begun the manufacture of C. A. Smith's patent inside iron car roof, and also of C. A. Smith's patent adjustable slip joint stove-pipes.

The Rail Market.

Steel Rails.—Several contracts of considerable size are reported. The mills are all full for two or three months to come, but it is said that concessions are being made on desirable orders, with a tendency somewhat toward lower prices. Quotations may be put at \$34@35 per ton at Eastern mills. Light rails are in some demand, and are quoted at \$36@39 per ton.

Rail Fastenings.—The market is steady, with a fair demand, and quotations unchanged at 2.40 cents per lb. for spikes in Pittsburgh; 2.75@3.10 for track-bolts and 1.65@1.80 for splice-bars.

Old Rails.—The market for old iron rails is a little more active, with several small sales reported. Quotations vary very much, and may be put nominally at \$19@21 per ton at tidewater. Old steel rails are quoted at \$20@22.50 per ton in Pittsburgh, according to condition and length.

The Smillie Car Coupler.

In the reports of car coupler tests at Albany in the *Railroad Gazette* of June 18, it was stated that the Smillie coupler failed on test No. 2 ("coupling with its own kind at quick speed.") The statement came from the fact of a separate experiment having been made with this coupler with a short link. It coupled with its "own kind" with its own link every time.

Curtis & Wood Car Coupler.

We are informed by the New York Railroad Commissioners that their official record of test No. 2 ("will couple with its own kind at quick speed") of the Curtis & Wood coupler shows that it was successful each time, and that it did not fail once, as reported by us in the *Railroad Gazette* of June 18. The tests were made in rapid succession and under circumstances which made reporting them correctly an exceedingly difficult matter.

The Burton Stock Car in England.

The Furness line steamer "Durham City" sailed from this port yesterday morning for London, carrying a full cargo of beef cattle for the English market. A peculiar interest attaches to this trip of the "Durham City," inasmuch as she takes to England two cars of the Burton Stock Car Co., being the initial step of a general introduction into Great Britain and Europe of these vehicles for the humane transportation of live stock. In this move the Burton Co. is being heartily seconded by the house of Prius & Zwanenburg of Holland, which controls the entire exportation of the celebrated Holstein cattle, and also the Durham, Jersey, Guernsey and other favorite brands of blooded stock.

Mr. Prius, head of the Holland shipping house, came to Boston some days ago to confer with the Burton Co. about the proposed introduction of the new cars abroad, and completed arrangements whereby successive shipments of the cars will be at once made to all the principal countries of Europe. The cars now employed in Europe are the common box car with open top, and many shipments of valuable cattle have been ruined by their use. In one instance an entire shipment of Holsteins, en route from Holland to Italy, was lost, the animals perishing of cold in crossing the Alps. If the improved cars had been used, Mr. Prius is satisfied that not an animal would have died from the cause cited.

The cars shipped by the steamer yesterday are worthy of description. Viewed from the exterior they present a marked contrast to the ordinary cattle car. Strongly made, well roofed and neatly painted, they at once suggest care and comfort of the animals confined in them, and an inspection of their interiors fully confirms all that the outside proclaims. They are built to carry 16 head of stock. At each end, at about 3 ft. from the floor, is a swinging trough of zinc, set in a wooden frame. In the outer rim of the frame, at intervals of 24 in., four stout iron rings are set, to which the cattle in transit are tied. The car is divided in the centre by a party partition of wood running from the roof to two-thirds the depth of the car. Beneath it is a trough similar to those at each end, with the single exception that it is made to do duty for eight animals, four on each side of the partition. Over each trough a trap door in the roof permits the insertion of feed, obviating any necessity of entering the car for that purpose. An ingenious device also secures water to the

animals. Just under the roof a large cast-iron pipe runs the length of the car. At each end and in the centre, smaller pipes tap the larger pipe, and discharge their contents into the troughs. Water is poured into the large pipe from the roof of the car, and from it is distributed to the troughs through the small pipes. The ventilation of the car is thorough. Two grated doors on each side, and two interstices running the length of the car on each side, give free access to the air; and the doors are so arranged that in severely cold weather they can be converted into solid barriers to wind and wet.

But 12 head of cattle were confined in each of the cars carried by the "Durham City." Owing to the motion of the vessel at sea, it was necessary to stall the animals at a right angle to the length of the car, and consequently the economy of space observed in the original arrangement of the car had to be sacrificed to the exigencies of a sea voyage.—*Boston Advertiser*, June 28.

A Great Cave.

A dispatch from Hazleton, Pa., June 30, says: "Between 3 and 4 o'clock this morning an immense cave-in occurred on the Lehigh Valley Railroad at No. 8 Stockton Breaker. The first alarm was given by a miner employed in the slope, and throngs of people hastened to the spot. The cave-in is about 300 ft. long and 150 ft. wide. When the accident occurred, there was a terrible crash and the shock was felt for some distance. Three tracks, on one of which were two trucks loaded with lumber, were swallowed up by the falling in of the earth. Telegraph and telephone poles and wires, and in fact everything in the immediate vicinity, went down with one sudden crash. The Anchor freight train was due about an hour later, and precautions were at once taken to have the train signaled and stopped before it could reach the scene of the accident. The freight train having been signaled, remained at Stockton, where the freight was unloaded from the cars and delivered to those of the Hazleton merchants who felt inclined to haul it by team to the town. All trains from both north and south were delayed for some time, and the 6:05 a. m. train did not leave the depot at this place at all."

Duluth Docks.

A telegram from Duluth says: "The large docks that are being built at Duluth are deserving of more than passing mention. This is the greatest piece of dock construction and improvement ever made on the chain of the lakes. More new dock has been built here within the last five months than in any lake city within a year or more. The whole dock system here has been changed from a long, continuous dock to a slip system, changing the dockage from a frontage of one mile to 7½ miles in that portion which is close to the centre of the town. The vast amount of lumber used in the construction amounts to about 37,000,000 ft. Besides this about 41,000 piles have been driven. The principal companies who have built docks are the Northern Pacific Railroad—one dock 1,200 ft. long by 200 wide, also a coal dock now in course of construction 2,000 ft. long by 400 wide; the St. Paul & Duluth Railroad dock, 1,200 ft. long by 400 wide, and covered by two of the largest warehouses in the world, they having a storage capacity of 150,000 barrels of flour and merchandise; the Northwestern Fuel Co.'s coal dock, 1,000 feet long by 800 wide, having storage capacity for 400,000 tons of coal; the Chicago, St. Paul, Minneapolis & Omaha Railroad Co.'s dock, 1,200 ft. long by 200 ft. wide (under construction); the Duluth Dock Co.'s dock, 400 ft. long by 200 wide, and a number of smaller docks. The whole aggregates a cost of \$2,200,000, including construction and dredging. The main reason of so much of this sort of work here is the remarkable increase in the business of this port. The shipments of northwestern products, such as flour, wheat, wool, hides, copper and silver ore and bullion, have reached as high as 43,000 tons within one week, not including the shipments of iron ore and lumber which have been very heavy."

THE SCRAP HEAP.

Left on the Train.

The Louisville Times contains the following: "Sleeping-car conductor E. G. Neeld, returning from Jacksonville, Fla., on his last trip, was somewhat frustrated over the finding of a fine, fat, plump baby, perfectly nude, lying in a basket that had been left in his car. A well-dressed woman got aboard his car at a little town south of Huntsville, Ala., carrying the basket with her. She paid her fare and remained quietly in her seat until the train reached Huntsville, when she shoved the basket under the seat and left the train, disappeared in the darkness. Mr. Neeld never found himself in such a predicament before, and what to do with the baby bothered him greatly. After a consultation with the trainmen, he turned the precious little fellow over to the station agent. Ever since this occurrence Mr. Neeld is very careful to see that all his lady passengers take everything with them when they leave his car."

Rats.

Quite an amusing incident is said to have occurred in Midletown Sunday afternoon last. It seems that a groceryman had occasion to ship some goods down the road on Saturday evening, but got them at the Erie freight house too late for shipment, consequently the goods had to lie over until Monday. A package of yeast cakes weighing five pounds was devoured during the night by the ravenous freight-house rats, and it was amusing to see how the yeast worked. About 3 o'clock Sunday afternoon, people waiting for the arrival of the milk train, were attracted by seeing rats run out from underneath the freight-house, go up like rockets, and explode with a noise similar to a small Krupp gun. Mr. Higham, of the Wallkill House, was said to have been kept busy all day sweeping up the rats' skins.—*Exchange*.

Fast Time.

Thursday the fast mail was three hours late, and for the first time failed to deliver the mail at the U. P. transfer at the hour required in the contract with the government, simply because it was beyond the power of locomotive speed to do so. The mail was delayed eight hours by a derailed train near Princeton, Ill. The run from Princeton to Burlington, a distance of 170 miles, was made in 178 minutes, including numerous stops. The change in Burlington was made in 5 minutes, and the train left at 3:35, pulled by Engineer Pete Yerickson, engine 54, who ran to Ottumwa, 75 miles, in 80 minutes. Engineer Jim Quinlan, with the old reliable 269, pulled out of Ottumwa at 5:03, was delayed 5 minutes at the Des Moines River tower, made 11 stops, and reached Creston at 7:45, 115 miles in 162 minutes. The distance from Creston to the transfer is 104 miles, which was covered in 110 minutes.—*Keokuk Iowa Gate City*, June 28.

Strikers Sentenced.

In Parsons, Kan., June 25, four of the leaders in the late strike on the Missouri Pacific, who had been indicted for conspiracy, were tried in the criminal court and were found guilty. The Court sentenced them to 30 days' imprisonment in the county jail and \$100 fine. A motion was made for a new trial. This is the first conviction under a number of in-

dictments for conspiracy which have been found against the men concerned in the long strike.

In Fort Worth, Tex., one of the Missouri Pacific strikers was tried for riot and convicted, being fined \$125 and, in default of payment, sent to jail. The indictment in this case was not for conspiracy, but for riotous conduct and interfering with the property of the company. A number of indictments of a similar kind are pending in the criminal courts at Fort Worth.

Fast Time on the Boston & Maine.

The locomotive "Massachusetts," with a special car attached, on June 19 made the run of 116 miles from Boston to Portland in 2 hours and 36 minutes, being an average speed of 44.6 miles per hour. The return trip on the same day was made in 2 hours and 30 minutes, or at an average speed of 46.4 miles per hour.

Mysterious Noises.

Concerning ghosts and haunted houses, the experience of one of the members of the Seibert investigating committee is rather interesting. He is a professor at the University of Pennsylvania, and resides in the suburbs of Philadelphia. At a certain hour each day one of the windows in his house rattles quite violently, and this entirely independent of wind or weather. Naturally, the gentleman was considerably puzzled at the phenomenon, for while there was absolutely no visible cause apparent, each day brought this manifestation of activity on the part of his otherwise quiet window. He determined to discover the cause, and thought at once of the railroad which ran a short distance from his home. He found, however, that no trains were in the vicinity at that time of day. The recurrence of the noise at precisely the same hour so far impressed him with the belief that it must have a connection with some well-observed time-table, that he pushed his investigations farther, and included another railroad several miles distant. On comparing his observation with the train schedule, the significant fact was discovered that a heavy train passed a spot within two or three miles of the house at about the same time that the window rattled. Following this clue, he examined the rock formations, and found that an outcropping ledge which received the full force of the train vibrations came to an end immediately under his window. This gave a satisfactory explanation of a phenomenon which in the hands of a less investigative person would have been sufficient foundation for a mild ghost story.

A Broken Train.

"There's a good many things happening on the road which you newspaper men don't get hold of, keen as you are," said a railroad conductor to a *Free Press* reporter the other day. "One reason is because every railroad man has orders to keep mum about accidents," replied the scribe.

"Yes, that's true in a measure, and I look upon it as a wise provision. The passenger who is pulled safely through a risk without knowing it should never be told of it. Two hundred passengers on my train had a risk the other night which would have set half of them crazy had they realized it, but not one single person knew the facts in the case."

"How was it?" "Well, we were a good many miles out of Detroit and such passengers as had berths in the sleeping-cars had turned in. Just as we struck a long down grade the draw-bar holding the first coach broke and let the engine go off with the baggage, mail and express cars. The bell cord broke, of course, but before we exactly understood what had happened the train was slipping down that grade at a lively pace and the engineer was buzzing along to keep from being run into. There was no great fear but that we could not set the hand-brakes and bring up in a few minutes, but at the next station ahead he had to sidetrack and let the express have the main track to thunder past on. We never have over five minutes to spare on that switch, and here we are losing time right along and the train broken in two. Had the engineer waited to pick us up there would have been an awful smash-up. He knew the danger, and he just waltzed off down the track with the throttle wide open and the drivers humming as he had never heard them before. He whistled the station-master out when he was yet a mile away, and the way they worked to get up the danger signal and get the locomotive out of the way brought out the sweat. We got our share of the train stopped two miles from the station, and it was well we did. It was probably the first time in the history of the station that a danger-signal had been displayed, and the express train ran by almost half a mile before she was checked. Had we been two or three minutes late, or the engineer hesitated too long, or the lamps at the station been out of order, the express would have thundered into the locomotive at a speed of forty miles an hour. A few of the passengers began that something was amiss after we side-tracked and began toggling up the draw-bar, but I don't think there was a single one of them who comprehended the close shave."—*Detroit Free Press*.

Old Locomotive Engineers.

There are three locomotive engineers on trains running out of this city who have held their positions over a quarter of a century, namely: Mr. George Payne, who has handled the throttle for over 36 years; Mr. Thomas Capron, freight engineer, who has stood at his post for 33 years; and Mr. John N. Shay, a veteran engineer of 25 years standing, now on the steamboat train, whose railroad life with this company extends back 35 years.—*Providence (R. I.) Journal*.

Attempt at Train Wrecking.

On the evening of June 27, as a passenger train on the Northern Railroad of New Jersey was passing around a curve below Closter, the engineer noticed something on the rails, and blew the whistle sharply and put on the air brakes as promptly as possible. The train was stopped in a short time, and on investigation it was found that two railroad ties had been put on the track, undoubtedly for the purpose of wrecking the train. One of the ties was thrown off, but the other lodged under the pilot of the engine close to the forward truck. It is believed that the ties were thrown across the track by some boys who had been in the neighborhood a short time before.

Ornamenting Railroad Stations.

"There never was more flagrant nor impertinent folly than the smallest portion of ornament in anything concerned with railroads or near them." Such is the explicit conviction of that arch-enemy of steam, Mr. John Ruskin.

The Brantwood philosopher, in his fervently illuminated "Seven Lamps of Architecture," decries the decoration of railroad stations as one of the most strange and evil tendencies of the present day. He conscientiously contends that if there be any place in the world in which people are deprived of the disposition necessary to the contemplation of beauty, it is there. Mr. Ruskin says that he would as soon "put rings on the fingers of a smith at his anvil," as make a railroad station pleasing to the eye. The railroad station, by the way, may be compared to the home of the smith—would he deny him Longfellow's "spreading chestnut-tree"? "It is," he continues, "the very temple of discomfort, and the only charity that the builder can extend to us is to show us, plainly as may be, how soonest to escape from it. * * * The whole system of railroad traveling is addressed to people who, being in a hurry, are therefore, for the time being,

miserable. * * * The railroad is in all its relations a matter of earnest business, to be got through as soon as possible. It transmutes a man from a traveler into a living parcel. For the time he has parted with the nobler characteristics of humanity for the sake of a planetary power of locomotion."

After these vehement remarks it would, perhaps, be idle to reason with Professor Ruskin. He can find no romance on the railroad. The carriage-windows of the train that conveys him from London to Con'ston frame no pictures that come and go with everchanging flight, relieved from monotony by comparison and kaleidoscopic contrast. Even the gigantic engineering works that excite the average mind by their sublime domination over the forces of nature; the lofty bridges where the traveler is

"Borne, like Loretto's chapel, through the air."

the romance of river and rock made more ravishing by engineering realism; the graceful viaducts whose curving arches span rainbow-like deep and devious valleys, with wood and water far away below, and which are quite as engaging as the ruined Italian viaducts that Turner idealized, convey no more intelligent expression than that of groveling commercial greed to the supersensitive soul of the author of "Modern Painters." I quite agree with my friend Mr. M. J. Baddeley in his protest in this connection. He says: "Railroads, in regard to their effect on natural scenery, have been abused wholesale. Poets have led the ways, and everybody with a 'soul for the beautiful' has followed. They are straight and square, and altogether out of harmony with the flowing lines of nature; yet Turner's pictures abound in straight or square palaces, and level-topped bridges in the mid-distance. The churches of a rugged region, says the canon of taste, should have square towers, and not tapering spires. Why, then, should the regular lines of a railroad be regarded as fatal to the natural beauty of the country through which it passes, or the express locomotive stronger than Samson, swift and smooth as the swallow in its flight, be aesthetically regarded as a shrieking monster? * * * To a great extent, railroads are bound to accommodate themselves to nature. They traverse a picturesque country in a succession of graceful curves, with here and there a lofty viaduct, and to the credit of our railroad potentates be it said they have shown more regard for the claims of Nature, while encroaching on her domains, than any other class of men engaged in mercantile enterprise. No unprejudiced man can assert that the pass of Killiecrankie has been spoiled by the Highland Railway, or that the beautiful valleys of North Yorkshire have suffered from the splendid viaducts by which the Settle & Carlisle line spans them. If there be any genuineness in the outcry against railways, it is the genuineness of a selfish, niggardly spirit, which wishes to shut out the beauty-spots of the earth from ninety-nine hundredths of its inhabitants."—*Cassell's Family Magazine for July*.

A Locomotive Engineer's Reward.

The Lake Shore limited train that arrived here Friday morning met with an accident at Petytsville, O., where it rushed into a freight train standing on the track. Orders had been given for the freight to precede the passenger, but there was either some misunderstanding about it or some carelessness. The flagman was away from his post of duty, and the result was a terrible crash. The passenger train, running at a speed of 45 miles an hour, crashed into the freight, knocking the caboose into splinters, and throwing the engine of the passenger train into the ditch. The caboose of the freight train was also smashed. The passengers soon learned that their lives had been saved by the coolness, courage and heroic behavior of the engineer, Thomas Stevenson, who stood like a hero by the engine, told the fireman to jump for his life, reversed and put on the brakes, when he was finally thrown from the cab. The passengers appreciated this and took up a collection for Stevenson, \$170 being raised and presented to him, with a set of complimentary resolutions adopted by them at a meeting held on the train.—*Chicago Inter-Ocean*, June 27.

A Narrow Escape.

The Scotland Neck (N. C.) Democrat states that on the Nashville Branch road the foreman, in blasting the hard earth in a cut, set fire to two fuses at the same time, leading to two deposits of powder near each other. One charge exploded, and he, thinking both had, went to the spot as the last exploded, was lifted upon a clay boulder out of the cut and landed 20 steps out in a field, up on his feet, unhurt.

The Brakeman's Story.

Otto Schwartz, brakeman on the Delaware Division way freight, relates the following incidents which he says he witnessed at Hancock last Friday: On the up trip he saw a large fish-hawk hovering over the river and he watched its manoeuvres. In a short time it was attacked by two common sparrows, and an aerial struggle, short, sharp and decisive, was the result. The hawk was not only worsted in the contest, but was so overcome that it dropped in mid-stream and floated down as far as his eye could follow it. On the down trip he was amused by another fight, this time between a crow and a rattlesnake, in a ditch alongside the track. He watched the battle for fully five minutes, when the crow flew off keeping up a continual "caw," "caw." He then went and found the snake dead. It measured 6 ft. in length.—*Port Jervis (N. Y.) Gazette*.

Continued association with the fishermen who frequent the Upper Delaware is having a bad effect on the Delaware Division brakemen.

In the Smoker.

Affable Traveler to neighbor in car—"Your name is very familiar to me, Mr.—er—ah—" Quiet Stranger—"My name is Mootzouckskiest Koroczotcocther; I am a Pole." Affable Traveler—"Yes; er—it—it isn't your name so much as your face; I was about to say your face was very familiar to me." Quiet Stranger—"Yes; I have been in Sing Sing prison fourteen years. I was discharged this morning." (Affable Traveler keeps on traveling, but quits affabbing.)—*Burdette, in Brooklyn Eagle*.

A Narrow Escape.

A dispatch from Marshall, Ill., June 26, says: "A remarkable accident happened to the west-bound through freight train on the Vandallia Line at Martinsville yesterday morning. Martinsville is approached from both directions by a long steep grade. As the train was flying around a sharp curve near Martinsville, one of the driving rods of the engine, a huge 10-wheeler, broke and instantly was revolving at a terrific rate, knocking the cab to splinters and battering the boiler out of shape. As the train flew by the station the other rod broke and the tender jumped the track. The two rods were revolving at lightning speed, dealing terrific blows on the cab and boiler, and the steam was escaping in clouds from the holes knocked in the boiler, while the tender was bounding along on the ties. As soon as the up-grade was reached on the other side of the station, the speed began to slacken and the train finally stopped with the engine on the centre of the long bridge over the north fork of the Embarras River. Providentially the tender jumped back upon the rails just before the bridge was reached, or a terrible wreck would have resulted. The engineer and fireman escaped from the cab when the first rod broke and were not injured."



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EDITORIAL ANNOUNCEMENTS.

Passes.—All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.

Contributions.—Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to ALL DEPARTMENTS of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.

Advertisements.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. We give in our editorial columns OUR OWN opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.

THE CENTRAL PACIFIC REPORT.

The Central Pacific Railroad report has for several years past covered the whole mileage of the Southern Pacific Railroad, which the Central Pacific leased. Last year the Central Pacific worked the Southern Pacific only the first two months of the year; the third month it worked its own system of 1,650 miles, north of Goshen, and during the remaining nine months of the year its road was worked by the new lessee company, the Southern Pacific Company, which latter now works substantially the same system as that worked by the Central Pacific before 1885 besides the line from El Paso to New Orleans. The report of the Central Pacific Company for 1885, strictly limited to the operations conducted by itself or on its own road by its lessee, can not, therefore, be profitably compared with the report of any previous year.

General Manager Towne, however, has given in his part of the report a statement of the earnings and expenses for the whole of the year of the 1,650 miles which now form the Central Pacific system, 1,254 miles of which is owned by it and the remainder leased, and by it subleased, with its own road, to the Southern Pacific Company, and he also reports traffic for the whole Southern Pacific Company system west of El Paso.

Ton and passenger miles are not reported, but the following statistics of traffic are given for the whole 2,802 miles worked west of El Paso.

The numbers of through and local passengers have been:

	1881.	1882.	1883.	1884.	1885.
Through.....	77,998	95,226	113,807	95,987	97,065
Local.....	1,507,318	1,698,129	1,634,935	2,235,979	2,123,137

Besides these there is the enormous number of passengers over the Oakland Ferry, which has increased from 5,447,000 in 1881 to 6,575,000 last year, but has changed little for the past three years. These ferry passengers yield but a small part of the earnings, but their numbers indicate the growth of San Francisco and Oakland.

The number of through passengers has been well maintained in spite of the opening of the Atlantic & Pacific Railroad, whose passengers are carried over the Southern Pacific to Los Angeles and San Francisco, but presumably are not counted among its through passengers. The opening of the Northern Pacific in 1883 doubtless diverted from the Central Pacific the whole through travel to and from Oregon and Washington, or its equivalent. That is, while some travelers visiting Oregon have gone one way by the Central or Southern Pacific, in order to see the country, as many visiting California have returned by the Northern Pacific for the same reason.

The length worked was 152 miles less last year than the year before, and 196 miles less than in 1883, but the road dropped is the Mohave Division, leased to the At-

lantic & Pacific, which has scarcely any local traffic, and the decrease in local travel, which is less than 5 per cent. from 1884 to 1885, is not chargeable to that, doubtless. The very large increase in travel since 1882 reflects the growth and prosperity of California, doubtless. Southern California especially has been making great progress in that time.

It may be noted here that during the 14 years ending with 1885 this railroad system brought 722,582 through passengers to California, and carried only 433,973 away, leaving a balance of 288,609 to increase the population of the Pacific Coast. The excess westward over eastward of late years has been:

	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.
	11,628	11,330	3,913	16,210	21,000	33,593	20,869	22,479

There have always been some passengers in both directions by the Pacific Mail steamers, but substantially all the rail passengers to and from Oregon and Washington as well as California went over this road until October, 1883. The largest number ever taken west in a single year was 74,919, in 1875, which was 44,497 more than went east, indicating a much larger emigration to California than there has ever been since.

As to freight traffic, ton-miles were given until this year, showing such considerable differences from year to year in the average haul of local freight, that the statement of tons hauled below is not a safe basis for judging of the amount of freight traffic. The tons hauled were:

	1881.	1882.	1883.	1884.	1885.
Through.....	288,734	390,000	336,446	361,024	378,421
Local.....	1,863,257	2,042,030	1,944,154	1,992,131	1,939,941
Company.....	595,133	677,693	543,342	515,255	427,415

The through freight increased nearly 5 per cent. from 1884 to 1885, while the local freight decreased 2½ per cent. The average haul in 1884 was 902 miles on through and 120 miles on local freight, at which rate the increase in through was 2½ times as many ton-miles as the decrease in local, and the total ton-miles were 691 millions, against 632 in 1884, 631 in 1883, 790 in 1882, and 633 in 1881. The falling-off in local was almost exclusively in grain, of which 120,000 fewer tons were carried than in 1884. The average haul on this may have been more or less than the average, but the total ton-mileage last year cannot have varied greatly from that of the two years previous. The through freight was but 5 per cent. less than in 1882 and 1883, when this road carried nearly all that went to the whole Pacific coast.

The statement of "company freight" carried is useful chiefly as indicating the amount of construction and renewal work done in successive years. It was very much less last year than in any of the other four.

The train mileage was smaller last year than in any other reported, freight and passenger train-miles having been:

	1881.	1882.	1883.	1884.	1885.
Pass.....	2,706,780	3,022,368	3,221,510	3,340,323	3,276,459
Freight.....	5,797,758	7,079,604	5,881,070	5,074,615	4,557,848
Total.....	8,504,538	10,101,972	9,102,580	8,414,938	7,834,307

This indicates a considerable increase in the average freight train load, the freight train mileage last year having been 10 per cent. less than in 1884, and 22½ per cent. less than in 1883, with apparently little change in the traffic. It may also be due in part to taking a larger proportion of the through freight over the Southern Pacific, which has easy grades, instead of the Central Pacific, which has numerous steep grades. But as the Southern Pacific is much the longer, a very much larger train load is necessary to enable the same number of tons to be carried with the same number of train-miles. The average train load had always been small—134 tons in 1884 and 117½ in 1883, while it rose to about 151½ last year.

A statement of the mileage of service trains is a further indication of severe economy in construction and maintenance, these being, in miles:

	1881.	1882.	1883.	1884.	1885.
Freight.....	767,274	1,025,134	619,084	662,455	298,210

—less than half as many last year as in any other year.

Perhaps as significant as anything we have this year is the mileage of cars, which has been:

	1881.	1882.	1883.	1884.	1885.
Pass.....	17,544,486	19,781,255	20,803,440	18,249,541	19,754,901
Freight.....	101,918,561	129,334,570	99,617,685	85,451,527	76,830,437
Total.....	119,463,047	149,115,825	120,421,125	103,699,068	96,585,338

We may not judge the traffic by this, for not only has the average capacity of cars increased greatly, presumably on this as on other roads, but the current of traffic in the two directions may vary so as to require larger car mileage for a smaller total traffic. But the reduction in freight car mileage shown above is marvelous. The decrease since 1883 is 21 per cent., though the traffic as nearly as we can ascertain was about the same in both years. The decrease since 1882 is 40 per cent., with an apparent decrease of 12½

per cent. in the traffic. The passenger car mileage was 8 per cent. greater in 1885 than in 1884.

The change in car mileage naturally should have an important effect on the working expenses. All these figures regarding traffic are, as we have said, for the whole 2,802 miles worked by the Southern Pacific Company. Those regarding earnings and expenses below are for the 1,650 miles of the Central Pacific only.

Compared with 1884 there was a large reduction in earnings, 6.2 per cent. in freight earnings, 10½ in passenger and 55 per cent. in "miscellaneous," in the aggregate amounting to \$1,612,550, or 10 per cent. But the decrease in working expenses has been even greater, amounting to \$2,031,989, or 24½ per cent. As our figures for traffic are for the Central and Southern Pacific together, while those for earnings and expenses are for the Central Pacific alone, any criticism of these figures is impossible. As, however, there seems to have been on the whole system nearly as great a traffic in 1885 as in 1884, we may suppose that part of the immense decrease in Central Pacific expenses was due to a transfer of through traffic to the Southern road. The result was an increase of \$419,440 (5½ per cent.) in the net earnings of the Central Pacific. Its gross and net earnings and working expenses in successive years have been:

Year.	Gross earnings.	Expenses.	Net earnings.
1882.....	\$17,045,926	\$7,670,012	\$9,375,914
1883.....	17,258,906	8,847,232	8,409,674
1884.....	15,096,970	8,338,588	7,658,382
1885.....	14,384,421	6,306,599	8,077,822

The decrease in gross earnings since 1882 has been continuous, and was greater last year than the year before even; the decrease in working expenses last year is none the less startling when set by the side of the expenses of 1883 and 1882, as well as 1884, especially as the average through rates must have been very low last year. The net earnings last year, though \$419,440 (5½ per cent.) more than in 1884, were \$1,948,092 (10½ per cent.) less than in 1882.

The only statement of the traffic of the Central Pacific separately is that last year it carried passengers as follows:

	East.	West.	Total.	Local.
Cent. Pac.....	31,140	59,221	90,361	1,708,206
Southern Pac.....	6,153	9,551	15,704	414,931
Total.....	37,293	68,772	106,065	2,123,137

From which it appears that the Southern Pacific had last year but 16 per cent. of the through passengers and 19½ per cent. of the local, while it has 41 per cent. of the mileage.

How far this great reduction in the earnings of the Central Pacific has been due to lower rates and how far to smaller traffic cannot be known from the reports. The Southern Pacific report may throw some light on it.

Under the lease to the Southern Pacific Company, the Central Pacific was guaranteed \$900,000 over all fixed charges for the nine months the lessee worked it; but its net earnings over charges for that time were \$1,422,033. The lessor has all the net earnings under \$3,600,000 per year. No dividends were paid last year. The working expenses exceeded the gross earnings for the three months before the lease; and after paying \$1,490,532 into sinking funds and for redeeming bonds, and \$386,119 for interest and sinking fund of the debt to the government, there remained a balance of only \$367,769, which is but 62 cents per share of stock.

New York Central Earnings.

The New York Central & Hudson River Railroad's gross earnings have been reported for April and May, and it is much to be hoped that monthly reports will be made hereafter. They were never made before except for about a year after the great sale of stock which the late Wm. H. Vanderbilt made.

The earnings as reported now have comparatively little significance, however, because they include the earnings of the West Shore road this year and not last. It must be practicable to ascertain what the monthly earnings of the West Shore were last year, and they ought, by all means, to be included in these monthly statements.

The statement as made is as follows:

	1886.	1885.	Increase.	P. c.
April.....	\$2,363,544	\$1,816,324	\$547,220	30.1
May.....	2,542,622	1,814,399	728,223	40.1

	1886.	1885.	Increase.	P. c.
Two months.....	\$4,906,166	\$3,630,720	\$1,275,446	35.1
Five months.....	12,248,377	9,562,942	2,685,435	27.6

From this we can only say that the gain was proportionally larger in April than in the first quarter of the year, and much larger in May than in April, unless the West Shore had an exceptionally large part of the traffic last year in April and May. As to that, we can only say that in the first three months of 1885 it brought 10.3 per cent. of the grain going to New York, against the New York Central's 38.9; in April the West Shore's share was 15.4 and the Central's

36.9; in May the West Shore's 13.8 and the Central's 35.8; also, that for the three months ending June 30 the West Shore's gross earnings last year were \$945,825 (an average of \$315,275 per month), having been \$885,242 in the first quarter of the year. Probably, therefore, the West Shore's earnings were not far from \$650,000 in April and May last year, which is \$625,000 less than the gain reported by the united roads this year over the Central alone last year, and something like this amount is the gain in gross earnings this year, which is about 15 per cent. The gain in net earnings may be quite as great as the gain in gross, being due chiefly to higher rates. In the April-June quarter last year the West Shore's working expenses were one-third (\$305,021) more than its gross earnings, and the New York Central's net earnings were \$380,042 (16 per cent.) less than in 1884, the surplus available for dividend being only \$239,771, or less than the West Shore's excess of working expenses over earnings. That is, the two properties together last year in this quarter did not earn net as much as the fixed charges of the New York Central alone; and a very great improvement over that condition of things is natural.

The New York Central statement of earnings and expenses for the quarter to June 30, made in declaring the dividend of 1 per cent. June 30, should properly be compared with the statements of the New York Central and the West Shore together for previous years. The statement as made shows that the united roads this year in comparison with the New York Central alone last year had \$1,902,366 (34 per cent.) more gross earnings, \$709,137 (18 per cent.) more working expenses, \$1,123,229 (65 per cent.) more net earnings, and that after paying all fixed charges there was available for dividend on the New York Central stock this year \$992,000 (\$1.11 per share), against \$239,771 (27 cents per share) last year and 82 cents per share in 1884. These latter figures show accurately the position of the Central shares, but to ascertain the course of business we must add the West Shore earnings and expenses for the quarter to those of the New York Central last year and the year before, as follows:

	1884.	1885.	1886.
Gross earnings.....	\$6,937,884	\$6,549,459	\$7,500,000
Expenses.....	5,152,029	4,854,155	4,588,000
Net earnings.....	\$1,815,855	\$1,695,304	\$2,912,000

A comparison with the fixed charges of the two companies last year would not be profitable, those of the West Shore not having been paid; but it is notable that the working expenses were decidedly less this year than in either of the other two, and, it may be added, less than the average expenses per quarter of the New York Central alone were in 1881, 1882 and 1883.

The fixed charges are now \$1,926,000 per quarter, against \$1,485,000 last year, \$1,395,000 in 1884, and less than \$1,300,000 in previous years; so in comparison with the years when 8 per cent. dividends were earned the surplus is greatly reduced—is little more than half, in fact.

For the nine months ending with June the statement published last Monday makes the surplus over fixed charges of the New York Central Company:

	1883-84.	1884-85.	1885-86.
Total.....	\$3,067,840	\$2,086,61	\$2,926,000
Per share.....	\$4.10	\$2.33	\$3.27

These have been the lean years of the New York Central Company; only in two years before had the profits per share fallen below \$8 for the whole year, having been \$6.43 in 1881-82 (\$4.82 for the nine months), and \$7.79 in 1876-77—both years when profits were greatly reduced by great railroad wars.

The statement of gross earnings made for April and May in connection with the statement for the quarter makes it possible to ascertain the June earnings, which were \$2,599,834, and \$626,918 (24 per cent.) more than the gross earnings of the New York Central alone last year, against a gain of \$728,226 (40 per cent.) in May, and a gain of \$547,220 (30 per cent.) in April.)

What is most remarkable in this statement is the smallness of the working expenses.

Last year the severest economy was practiced, because of an actual lack of money; but this year the train movement is doubtless very greatly reduced, especially on the West Shore, and in the first quarter of 1886 the expenses of the two roads were actually \$433,672 less than last year, which of itself is 48 per share of New York Central stock, and in the second quarter there was a further reduction of \$266,155, or 30 cents per share, so that of the profit of \$1.34 earned in this half-year, no less than 78 cents, or three-sevenths, was due to a reduction of expenses. The New York Central's expenses were smaller in these quarters last year than in any other in its recent history, but

the West Shore's seem to have been unduly large, being larger in the June quarter than in any other quarter of its brief history.

The Lake Shore Strike.

The renewal of the strike of the Chicago switchmen on the Lake Shore road is disquieting, because it indicates that the general failure of other railroad strikes has not caused some of those most familiar with them to avoid entering on a new one, in which they must have known that the public generally would condemn them. It is, in fact, the same old strike. When the switchmen resumed work last May they gave out that they were assured that the eight men for whose removal they struck would not hold their places more than six weeks. The Lake Shore management immediately denied that it had made any such agreement, and declared that the eight men, being old and acceptable employees, should keep their places as long as they wanted them. When the six weeks expired, however, and these men were not discharged, the switchmen struck again; and it now appears that they actually had been assured by the Sheriff of Cook County that the men objected to should in some way be removed. Moreover, the Sheriff asserts now that President Newell had agreed to this. Of course it is hardly conceivable that the company should have made such an agreement and then immediately and publicly, without the intervention of a day, positively denied it.

So far it does not appear that the striking switchmen complain of anything except that the company employs these eight men, or that they have any other objection to them than that they do not belong to their union.

The strike now, like the one in May, is remarkable for the failure of the public authorities to keep the peace. Violence was resorted to at once, trains being taken possession of and run off the track and engines disabled; but for some time the county of Cook made no attempt to preserve the peace, and most that was done was by the company itself, which employed men who were made special officers of the town of Lake, which is the chief seat of the disturbances. It seems very unfortunate that this should be so, because it is apt to leave the impression on the law-breakers that it was not the community but the railroad company that opposed their lawlessness. It is of the utmost importance that we all, and especially that all organized or other bodies of men, should feel and experience that the state will not abide lawlessness for a moment, and that every attempt to interfere with the lawful conduct of any business should be instantly stopped by the arrest of the offenders by recognized officers of the law. None of the troubles—we do not mean the strikes, but the violent interference with trains, etc.—we have had this year would have lasted a day if there had been instant and quiet arrests of those who first used violence; there would have been no clubbing, no shooting, no burning and no rioting, and very little hard feeling against the authorities or those who invoked their assistance. But when men have been permitted to carry on what is virtually an insurrection for hours and days with no effective opposition from the public authorities, they look upon any interference with them as an outrage. This is especially the case when the men who exercise the authority of the law are employed by railroad companies for that purpose. This makes the neglect of the recognized public authorities the more regrettable.

At Chicago the yards are largely south of the city limits in the town of Lake, which is full of railroad yards and shops and packing houses, but has not population enough to maintain a large police force. The county of Cook, however, can muster force enough to keep perfect order on any of its railroad lines, and the state of Illinois certainly is strong enough to keep the peace. Every such outbreak as this, successful by unlawful violence even for a little while, is an encouragement to further attempts of the same kind. Men who have done such things with impunity once will do them a second time with much less hesitation than at first; and even severe punishment coming late is less effective than firm repression, almost always possible with a few arrests, at the beginning. We hear now of numerous trials and convictions of men guilty of crimes in the Southwestern strike last March; but we believe that the arrest of the first eight or ten men who took possession of engines or misplaced switches in Texas or Missouri would have been more effective to prevent the recurrence of such acts than the sentencing of fifty men to the penitentiary

now. The long dallying with the insurrection tended to make men criminals, and we are not by any means sure that we have seen the last or the worst of it.

Second-Class Passengers to Chicago.

Supplementary to the account given last week of the sales of New York-Chicago first-class tickets for the last three years, we give the number of second-class tickets from New York to Chicago, the aggregate receipts therefrom and the average rate for the trunk-line proportion, which is about 47 per cent. of the through rate, as follows:

	1883.	1884.	1885.
Jan. 1 to June 30:			
No. tickets sold.....	6,557	8,548	10,292
Receipts therefor.....	\$48,004	\$63,330	\$29,390
Av. per ticket.....	7.46	7.41	2.86
July 1 to Dec. 31:			
No. tickets sold.....	13,940	18,618	17,989
Receipts therefor.....	\$102,697	\$122,068	\$56,283
Av. per ticket.....	7.37	6.49	3.12

The second-class traffic in this time was somewhat complicated by the immigrant traffic. In the first half of 1882, for instance, immigrant tickets were being sold to others than immigrants, which reduced the sales of second-class tickets. After the rail-road war broke out, however, immigrant rates were maintained for several months, making second-class rates lower than immigrant rates, the consequence of which was that a good many immigrants bought second-class tickets. We see that the second-class rates kept up much better than the first-class in the last half of 1884; the first-class rates fell from \$9.10 in the last half of 1883 to \$7.27 in the last half of 1884, or \$1.83 (20 per cent.), while, as shown above, the second-class fell only from \$7.37 to \$6.49, or 88 cents (12 per cent.). The ticket sales in the first half of 1884, with a \$2.86 rate (equal to \$6.10 to Chicago), were but 1,714 (20 per cent.) greater than in the first half of 1884, with a \$7.41 rate. In the last half of the year the sales were 829 (4 per cent.) less in 1885 than in 1884, in spite of a reduction in the rate to Chicago from \$13.81 to \$6.64, or 52 per cent. The change in the immigrant traffic helps to explain this, but it remains plain that in second-class as in first-class fares the increase in traffic did not nearly make up for the reduction in rates. At an average rate of \$7.40 the second-class passengers to Chicago brought the trunk lines \$151,601 in 1883; at an average rate of \$6.77 they yielded \$185,427 in 1884, and at an average rate of \$3.03 in 1885 the second-class earnings were but \$55,673—54 per cent. less than in 1884 and 44 per cent. less than in 1883.

It will probably surprise many to find that the second-class passengers form so considerable a proportion of the whole. In the three years the numbers of first and second have been:

	1883.	1884.	1885.
First-class.....	60,194	94,582	104,447
Second-class.....	20,497	27,306	28,251
Total.....	106,691	121,948	132,698
P. c. second-class.....	19.2	22.4	21.3

So that more than one-fifth of the passengers to Chicago in these three years were second-class.

American manufacturers have just achieved another triumph in the award of the contract for 280,000 ft. (53 miles) of wire rope for the proposed new cable lines in Melbourne, Australia, where it has just been decided to build 26 miles of cable road, the government having guaranteed the company's 4 per cent. bonds. The cars likewise will, we infer, be built in this country, as is the case with nearly all cars for street lines.

The sudden rise and rapid spread of the cable railroad system, which has hardly been out of the experimental stage more than ten years, is one of the notable features of the day. Many lines have been built already in all parts of the world and many more are projected or talked about. It plainly filled a want. One of the most promising things about it, however, which has hardly begun to be thought about as yet, and which we have never seen mentioned, is the possibility that it may yet prove of great advantage to railroads which are at once blessed with heavy traffic and cursed with sections of heavy grade. Wherever an almost continuous stream of cars has to "march up a hill and then march down again" by locomotive power, the possibility of an adaptation of the cable system is one well worthy of attention. The old inclined plane plans fell into such complete disfavor for railroad purposes for reasons which have in good part passed away. It was impossible to use curves and to break grade on the plane. It was impossible to run the engines continuously. It was difficult and rarely possible to make any large rise on one plane. The modern wire cables did not exist, and hemp ropes (as used at the Allegheny Portage) or flat metal bands (as used at Mauch Chunk) were a poor substitute. Above all, the machinery

could not be kept continuously employed, because there was not business enough to require it. But a short, steep cable line moving two to four miles per hour, admitting of considerable curvature and changes of grade, with no need to bury the cables underground, and with powerful grips applied and released at top and bottom of the plane by men jumping on and off the car, so that no one need ride up the plane with them, and with the possibility of running the cars from the top of the plane by gravity, for perhaps 20 or 30 miles, until low grades were struck again, would be a very different matter.

The chief economy would come in saving the cost of lifting locomotives up and down the grade, which on heavy grades are a very large proportion of the total weight of trains; but there should also be a large saving in wages, and in rail-wear and maintenance of way, as well as some saving in the cost of power developed per horse-power, even after allowing for the friction of the cable, which on very low-grade lines absorbs a large proportion of the power, but on a comparatively short, steep line would absorb much less.

The New York Central & Hudson River Railroad in its last fiscal year (ending Sept. 30) carried 1,655½ millions of ton-miles east and south, and 467½ west and north, there being 354 tons east to every 100 west. On the Erie there were 609½ west to 1,078 east, or 177 east to 100 west. Thus, while the east-bound movement was 577 millions (35 per cent.) less on the Erie than on the Central, the west-bound movement was greater on the Erie by 142 millions, or 23½ per cent. This is due doubtless to the great coal traffic on the Erie; for the west-bound merchandise movement is very much greater on the Central—greater from New York, and universally greater from New England and interior New York.

This nearer approach to equality in the current of traffic in the two directions gives the Erie an enormous advantage in keeping up its average train load and keeping down its average expense per ton per mile. Thus last year the average train load was 188 tons on the New York Central and 252 on the Erie, while the reported expense per ton per mile was 0.46 cent on the Erie and 0.51 on the Central, the latter being much the easiest road to work. If the New York Central's east-bound freight had been no greater than the Erie's its whole freight train mileage might have been reduced 35 per cent., and then its average train load would have been 209 tons, and if at the same time it had had as much west-bound freight as the Erie, its average train-load would have been 228 tons.

This shows the very great value of its coal traffic to the Erie. But for the great increase there has been in this of late its average train-load would be materially less and its average expense per ton-mile materially greater than they are.

The combined Michigan Central and Canada Southern roads in the first half of successive years have earned:

	1883.	1884.	1885.	1886.
Gross.....	\$6,740,000	\$5,603,000	\$4,973,000	\$5,436,000
Expenses.....	4,591,000	4,210,000	3,896,000	3,902,000
Net.....	\$2,149,000	\$1,387,000	\$1,087,000	\$1,484,000
Fixed charges....	1,210,000	1,280,000	1,320,000	1,290,000
Surplus.....	\$939,000	\$107,000	.....	\$194,000
Deficit.....	.....	.....	\$233,000	.....

The Michigan Central secures \$47,640 of this because of a reduction of its fixed charges of that amount, and this with its two thirds of the balance profit this year, is equal to \$145,213, or about 78 cents per share; the Canada Southern's \$48,787 is 32½ cents per share.

The half-yearly report of the Lake Shore & Michigan Southern shows a gain over last year of 7.2 per cent. in gross and nearly 35 per cent. in net earnings, and a surplus over fixed charges of \$549,389, against a deficit of \$75,909 last year, and a surplus of \$868,740 in 1884 and of \$1,746,802 in 1883. The surplus this year is at the rate of 93 cents per share of stock, and no dividend is declared.

Morgan's Louisiana & Texas Railroad and Steamship Company was, during the time of the late Charles Morgan, almost a private property, and very little information concerning its operations was attainable. The railroad was a short one and rather a tender to the steamers than an independent property. Of late years the railroad has been much extended, but there is now but 342½ miles of it, of which 204 is the main line, forming part of the route from New Orleans to Houston, and the rest is in nine different branches. The proportion of steamer to railroad property is still very large, there being six ferry steamers, two river steamers, and no

less than 16 ocean steamers, with an aggregate capacity of 29,328 tons, besides the tugs and barges of the Houston Direct Navigation Co., in which the Morgan Company is an owner. It is a serious omission in the balance-sheet that the cost of the steamship property is not stated separately. "Cost of road" and "construction and improvement" evidently include steamships as well as railroad, the other enumerated assets being specified small items. The distinction is important because of the mortgage debt, the steamship property not being permanent in the sense that the railroad is. It might wholly disappear, and it might be wise not to renew it, before the bulk of the bonds mature in 1918. The funded debt is, however, only at the rate of \$19,400 per mile of railroad, and the interest on it amounts to \$1,340 per mile, which is not a very heavy load, though more than some Southern roads are able to bear. This road, or 204 miles of it at least, however, is the sole railroad connection of New Orleans with the country west of it, and ought to have very much larger earnings than the average Southern railroad. Whether it has or not we are left to guess, however, for the earnings of the railroad and steamships are lumped together, and we can only say that last year the whole property earned \$4,203,598 gross and \$1,594,437 net, and that the latter amount is about 3½ times as much as the interest on the present debt. The solitary shadow of an indication of the earnings of the railroad is in the fact that while the freight earnings for the year were \$3,575,312, the passenger earnings were but \$524,393. The steamers do not carry many passengers and the railroad's earnings from freight are not likely to be three times as great as from passengers, so that if all the passenger earnings were from the railroad, its total freight and passenger earnings were probably not more than \$2,100,000, or \$6,130 per mile, which is large for a Southern railroad, but not as much as the Houston & Texas Central earned previous to 1884.

This would leave about \$2,000,000 for the earnings of the fleet, which is about \$70 per ton of capacity.

Military and Railroad Discipline.

"The mistake of military ethics," wrote Mr. Walter Bagehot, the late editor of the London *Economist*, one of the most suggestive of modern writers, "is to exaggerate the conception of discipline, and so to present the moral force of the will in a baser form than it ever ought to be taken. Military morals can direct the axe to cut down the tree, but it knows nothing of the quiet force by which the forest grows."

The terms of the sentence exactly reversed would describe what, imitating Bagehot, may be called railroad morals.

The railroad may be said to rely upon expectation in the same sense that the army relies upon discipline. One relies upon training and exact and immediate obedience to officers, the other upon the prompting of motives which have been brought into harmony with a system, obedience being rather to an order of things than to persons. Orders upon a railroad which may be disobeyed without producing disorganization of the regular order of things are extremely difficult to enforce. An engineman will not disregard a dispatch requiring his own to wait the passing of another train, because there is something besides the order to enforce obedience, namely, the consequences of going forward; but in the West it has been found necessary to make semaphore arms into gates, which will be broken in overrunning the signal. If a mere semaphore has been overrun, there is little difficulty in arranging with the signal-man to make no report.

It is not assumed that the engineman purposely overruns a signal, but the device illustrates graphically what is so often experienced by minor and even general officers, namely, the difficulty of enforcing orders which do not derange a regular order of things.

In his "Spirit of Military Institutions," one of Napoleon's most faithful officers, Marshal Marmont, writes:

"Three operations are necessary to convert a mass of men assembled together into an army: 1, to organize; 2, to discipline; 3, to instruct. And the complement of the organization, discipline and instruction is confidence—an essential element, the absence of which deprives an army of a great part of its value. This confidence should extend to all and each: confidence of soldiers among themselves in their reciprocal relations; confidence of each officer and soldier in their higher commanders, and especially in their commander-in-chief. * * * The national guards, supposing them to be composed of everything that there is bravest on earth, will never be worth anything at the beginning, for as the value and capacity of each cannot be appreciated by the others until they have had experience of each other, the first attempts will be made without the aid of mutual confidence, and will probably lead to great and irreparable misfortune."

So far as its general officers have a reputation for "push" and "smartness," they aid in giving the road a certain popularity, but in general financial confidence appears to be sufficient for its operators. The mutual confidence of the soldiers in each other finds its counterpart in the habits of working together which the men of a railroad acquire, and which consists not so much in co-operation as in learning the limits of responsibility it is wise to take, and especially in seeing what is the essential part of one's duty. On a railroad in almost every department of service, men act very much as individual soldiers assigned to special duty.

The counterpart of the training and instruction of the army is upon a railroad so purely "practical" as at times to

assume a slightly comic aspect. To hear men inquiring for "some book" to explain the working of an air brake, upon their control of which within the next hour may depend the lives of a number of human beings; to place men for four or six years in charge of the burning coal without instructions as to the simplest and most fundamental principles of combustion, strikes the mind as peculiarly and intensely "practical," in the humorous sense of that word, and in general the drill and careful training of the army for concentrated action is in striking contrast with the loose method of fitting men and ascertaining their fitness for action which must be largely individual.

There are good reasons for believing that the raw, untaught brakeman often suffers from accident because he has had no training in his dangerous duty. Such men are not seldom killed within a short time, sometimes within an hour, after entering service. Where low wages are given the green hands are numerous, and so also are the accidents.

In this sense, to speak of the counterpart of the organization of the army, a railroad is often very poorly provided for; but here, also, the fundamental contrast of the two organizations becomes apparent. In recent years, and even now upon some roads, there has been large liberty for the individual to find his best way of carrying on his part of the system. A small illustration of this fact was the discovery that the crews of a number of freight trains were stopping over for an hour at a little hotel, where a particularly good and cheap dinner was served. Inquiry of the men did not reveal any orders on this point, but it was said that the crews arranged to make it possible.

Conversation with a large number of enginemen has left the impression that a breakdown on the road often is an occasion for the exercise of sagacity and invention rather than memory, and the writer is not aware of any special instruction to young enginemen as to such an emergency. As a fireman he is "expected" to have learned about these things. Unquestionably men who are to have a certain freedom and an individuality of duty are better trained for this by the loose method of railroads rather than by the immediate direction and submission of army drill; but by so much the more do they need instruction as their duty is to be individual. And this is the point of contrast which was referred to a moment since. The railroad has in it something of "the quiet force by which the forest grows," of which, as Mr. Bagehot says, military morals knows nothing.

As a productive institution the conditions of a railroad are constantly changing by enlargement and toward complexity. It comes under Von Baer's law for all organic growth, namely, from the general to the special. Such growth is development, and must not be cramped or thwarted by theory. The most insubordinate language and the loudest complaints have been heard on a road growing (possibly the cause cannot be stated with certainty) partly out of an order which is usually most grateful to enginemen and firemen—that each crew run one engine exclusively.

A very heavy traffic kept men constantly on the road, and a crew which had been out twenty hours must needs turn about and return, as the engine was needed. The local master mechanic confessed that the system was a mistake, and the men were abusive to his face to such a degree that discipline seemed to be at an end. Railroads and even portions of roads have their peculiarities of condition; one of the difficulties of large systems arises from the fact that theoretical policy tends to take the place of natural development. For officers certainly, and in early times for the men, freedom for individual action upon the facts of daily experience has been an advantage to American railroads. Even if railroad economic law by its own action shall consolidate all roads into a few large systems, their previous separate origin and conduct will have resulted in a flexibility of policy not otherwise produced.

Erie Earnings in May.

The May report of this road, as indicated by the extraordinarily large receipts of grain at New York over it, noticed heretofore, shows an immense gain over last year.

For the nine years since the reorganization the gross and net earnings and working expenses of the Erie proper in May have been:

Year.	Gross earnings.	Expenses.	Net earnings.
1878.....	\$1,172,901	\$919,482	\$253,419
1879.....	1,350,474	1,064,687	285,787
1880.....	1,592,544	972,436	620,108
1881.....	1,776,890	1,076,925	699,965
1882.....	1,681,798	1,029,439	652,359
1883.....	1,660,174	1,063,305	596,869
1884.....	1,308,345	966,768	341,577
1885.....	1,230,857	867,204	363,653
1886.....	1,601,735	995,527	606,208

The gross earnings this year were exceeded only in 1881, 1882 and 1883, and the net earnings in 1880, 1881 and 1882, and not much then.

The increases since last year were:

Amount.....	Gross earn.	Expenses.	Net earn.
Per cent.....	\$370,878	\$128,324	\$242,554
	30.1	14.8	60.7

An increase of two-thirds in the net earnings is a very great gain indeed.

Meanwhile the profit or loss on the working of the leased New York, Pennsylvania & Ohio road has been, in May:

1883.	1884.	1885.	1886.
Profit.	Loss.	Loss.	Profit.
\$34,188	\$47,005	\$49,355	\$0,453

And the net result to the Erie from both roads:

1883.	1884.	1885.	1886.
\$631,055	\$294,572	\$314,208	\$826,661

which are to be compared with the net earnings of the Erie proper in previous years. This shows the profit this year to have been but \$4,394 less than in 1883, \$25,698 less than in

1882, \$73,304 less than in 1881, and much more than in any other year.

For the eight months of its fiscal year ending with May the earnings and expenses of the Erie proper have been:

Year.	Gross earnings.	Expenses.	Net earnings.
1877-78	\$10,731,514	\$7,544,717	\$3,186,797
1878-79	10,812,394	7,783,002	3,029,392
1879-80	12,403,673	7,982,561	4,421,112
1880-81	14,096,816	9,144,126	4,952,690
1881-82	13,118,245	9,042,401	4,075,844
1882-83	13,433,339	9,109,334	3,933,505
1883-84	11,612,468	8,341,937	3,270,531
1884-85	10,037,366	7,147,505	2,889,861
1885-86	11,687,289	7,679,620	4,007,669

The gross earnings this year were exceeded in each of the four years from 1880 to 1883, but the net earnings only in the three years from 1880 to 1882, and only very little in 1882. The gains over last year are:

Amount.	Gross earn.	Expenses.	Net earn.
Per cent.	\$1,649,924	\$532,115	\$1,117,809
	16.4	7.4	38.3

The profit or loss on the leased New York, Pennsylvania & Ohio for the eight months has been (it had been leased but one month in 1883):

1883.	1884.	1885.	1886.
Profit.	Loss.	Loss.	Profit.
\$54,181	\$274,083	\$69,937	\$39,917

And the net result to the Erie from both systems has been:

188-83.	1883-84.	1884-85.	1885-86.
\$3,987,09	\$2,996,448	\$2,819,923	\$4,047,586

The gain over last year is thus \$1,227,063, or 43½ per cent., and the profits have been much above the average this year—a very remarkable result for a year which has generally been so unfavorable.

Indian Grain Exports.

The exports of wheat from India have properly attracted much attention, because of the suddenness with which they became large, and their direct competition with our own exports; but they after all probably have less effect on the aggregate demand for breadstuffs than the Indian exports of rice, which have always been large, and somewhat larger since the wheat exports became larger than they were before. The official report of the Indian exports gives the exports of wheat and rice for the ten years ending with March, which, to facilitate comparisons, we have reduced to bushels of 60 lbs.:

Year to March 31:	Wheat.	Rice.	Year to March 31:	Wheat.	Rice.
1877	10,423,000	37,173,000	1882	37,167,000	53,924,000
1878	11,896,000	34,401,000	1883	26,405,000	58,348,000
1879	1,973,000	39,067,000	1884	39,118,000	50,475,000
1880	4,110,000	41,376,000	1885	29,551,000	41,197,000
1881	13,894,000	50,896,000	1886	39,313,000	52,672,000

Thus we see that the wheat exports may be said to have begun in 1882, and to have made no progress since, being nearly as large then as in any following year. For the five years from 1877 to 1881 the average yearly exports of wheat were 8,459,000 bushels; for the last five years they were 34,311,000 bushels, or four times as great.

In every year the exports of rice have been greater than those of wheat, last year one-third greater, and in most other years more than that. During the five years 1877 to 1881 that the average wheat exports were 8,459,000 bushels a year, the average rice exports were 40,703,000 bushels a year; and during the last five years the average has been 51,323,000 bushels of rice to 34,311,000 of wheat. But the rice exports increased a year before the wheat exports, being 38,154,000 bushels a year for the first four years of the ten-year period, and 51,252,000 for the last six years. Thus the supply of rice from India has been 13,098,000 bushels a year larger than it used to be, and the supply of wheat 25,852,000 bushels larger—the increase in rice being about half as great as the increase in wheat.

It is commonly said that the increase of the Indian exports of grain has been due chiefly to the construction of new railroads, but it is probably in fact due to a much greater extent to a great reduction in the rates on the old railroads. A great part of the wheat exported is produced at distances from Calcutta and Bombay about equal to that from Chicago to New York, and rates have been made for this distance which are about equivalent to 30 cents per 100 lbs. from Chicago to New York, which at the time our railroads were trying to get. There has been very little new railroad built in India, as we count much and little, the 9,194 miles at the beginning of 1881 having grown to 11,242 miles at the beginning of 1885. The 2,000 odd miles of new railroad cannot have been the chief cause of the larger exports, though probably they have helped. Lower ocean rates from India to Europe have probably helped also. Large as the exports seem, they are often all but a narrow margin over the requirements for India's consumption, its 240,000,000 people probably consuming as much as 1,200,000,000 bushels, as they do not eat much else, and especially very little meat. The 92,000,000 of wheat and rice exported last year was only 23 lbs. per inhabitant, or not more than four weeks' supply.

The cost of ferrying cars over the Mississippi at New Orleans last year is reported by Morgan's Louisiana & Texas Company to have been 59 cents per car, and 81,135 cars were transferred. This crossing is something like that between New York and Jersey, but the changes in the water level are much the greater at New Orleans, and the Mississippi there is only about half as wide as the Hudson at New York.

The Forney car seat has been placed on a new train of passenger cars, just turned out of the West Albany shops of the New York Central and Hudson River road. This train is now running on the local express between Poughkeepsie and New York, which carries a large number of passengers daily, and we are informed that the seats meet with general

approbation from both the regular and occasional travelers by the train.

The locomotive for the Finland State Railroad which we illustrate in the present issue presents a forcible example of the abandonment of the narrow-gauge system in Europe. The line in question passes through a very thinly-populated country, and the severe climate will always limit the amount of traffic. The line, therefore, has been cheaply built of the ordinary Russian gauge, 5 feet. The rails are light, weighing only 44 lbs. per yard, and the load is limited to 16,000 lbs. per axle. The speed is not to exceed 19 miles per hour.

The narrow-gauge system has been tried on a large scale in both Russia and Sweden, the countries immediately adjoining Finland, and apparently the experience thus gained has shown that all the advantages of a narrow-gauge line can be gained by adopting an ordinary gauge railroad with light rails and cheap construction generally. The advantages obtained by avoiding break of gauge and the many inconveniences of the narrow gauge remain as unmixed gain.

"We want as little red paint about a railroad as possible; red is reserved for signals," said a well-known Chief Engineer. A few roads are putting bright red paint on their freight cars—the cheapest and best preservative for wood, but, it would seem, an unnecessary use of the reserved color. Other roads have recently discarded red flags and lanterns on "specials," to avoid its common use. A red caboose is certainly a protection, but a red train must be some small disadvantage to eyes which must detect at any moment the slightest glimmer of the color on the track. There would be solid reasons for painting cars blue if this were not an expensive coloring, since a mass of blue increases the sensitiveness of the eye to red, and can be seen at night with considerably less light amid the darkness than any other color—as the blue of the sky witnesses on the darkest of nights. Whether to protect their eyes, or for this effect, canal boatmen often paint the roofs of their cabins, tool-boxes, etc., blue. A color of this sort would have advantages in switching on dark nights. But a really grave error lies in painting the shades of locomotive cab lamps red, since the full sensitiveness of the eye to any color is only momentary. This is not a common practice, but is in use on some roads. Indifferent matters of this sort are wisely kept on the side of safety.

Record of New Railroad Construction.

Information of the laying of track on new railroad lines is given in the current number of the *Railroad Gazette* as follows:

Chicago, Burlington & Quincy.—The Geneva Branch of this company's *Burlington & Missouri River* line is extended from Geneva, Neb., south to Straung, 10 miles.

Chicago, Burlington & Northern.—An increase of 18 miles at various points is reported.

Chicago, Evanston & Lake Superior.—Extended from Calvary, Ill., north to Evanston, 1½ miles.

Clearfield & Jefferson.—Track laid from Irvona, Pa., west to the Susquehanna River, 16 miles.

Dubuque & Northwestern.—Track laid from Hayfield, Ia., southward 10 miles.

Pittsburgh & Western.—The *Narrow-Gauge Division* is extended from Mt. Jewett, Pa., northeast 6 miles.

St. Augustine & Palatka.—Completed from St. Augustine, Fla., southwest to the St. Johns River opposite Palatka, Fla., 30 miles.

Southern Pacific.—The *Northern Division* track is laid to a point fifteen miles southward from Soledad, Cal., an extension of 12½ miles.

This is a total of 104 miles on 8 lines, making in all 1,375 miles thus far reported for the current year. The new track reported to the corresponding date for 15 years has been:

Miles.	Miles.	Miles.	Miles.
1886.....1,375	1881.....2,281	1876.....740	
1885.....864	1880.....2,190	1875.....426	
1884.....1,213	1879.....1,008	1874.....690	
1883.....2,169	1878.....691	1873.....1,518	
1882.....4,415	1877.....689	1872.....2,754	

These figures include main track only, second or other additional tracks and sidings not being counted.

NEW PUBLICATIONS.

Der Betrieb auf den Englischen Bahnen (The Working of English Railroads): by Eduard Frank, Inspector of the Austrian State Railroads, Vienna. Published by A. Hartleben.

This is an example of a kind of work which the Germans do much of—the study of the railroads or some phase of the railroads of foreign countries by expert railroad officers. It is more than 12 years ago (Dec. 20 and 27, 1873) that we published a translation of the chapter on freight traffic in Schwabe's interesting German study, "Ueber Englische Eisenbahnen," and several other German works on English railroads have appeared, and two or three French ones. So Bartels, Kupka and others have written in German to some extent of our railroads, Malézieux and, at great length and notable ability, Lavoinne and Pontzen in French. This latest work treats especially of the operation of English roads, and though of course it describes particularly what strikes the Austrian railroad man as peculiar or notable, which may not always be what would most interest an American, there is much in it which is interesting and suggestive here; parts of which we may present hereafter. The nature of the work may be known from the following chapter headings: Organization and Administration; Passenger Service; Long Distance and Through Traffic; Issue of Tickets; Passengers' Baggage and Small Packages; Street Conveyances to and from Stations; Passenger Cars; Traffic of the London City Railroads; Service of the Under-

ground Roads; Working of the Berlin Elevated City Railroad and Belt Railroad; Freight Service; Signal Service; Interlocking Signals and Switches and Safety Apparatus.

Foreign Technical Notes.

The progress made in equipping English railroads with continuous brakes is shown below, the time of year being June 30, except the last two percentages, which are for Dec. 31. The figures are the percentages of the whole number of locomotives and passenger carriages in the kingdom fitted with such brakes:

	June.	June.	June.	June.	June.	June.	June.	June.	June.
	1878.	1879.	1880.	1881.	1882.	1883.	1884.	1885.	1886.
Engines.....	13	19	27	39	51	60	67	74	86
Carriages.....	19	25	36	48	61	69	76	77	82

This is not such rapid progress as was made here, but it is steady, and the work is now nearly complete.

The British Board of Trade Report shows that in the last half of 1885 the working expenses of English railroads were generally a smaller percentage of the receipts than in the corresponding half of 1884, varying from 39.4 (Metropolitan) to 57.3 (Lancashire & Yorkshire). The expense per train mile which is the only criterion we have of the cost of working British railroads, was lowest on the London, Tilbury and Southend, 51½ cents, and highest on the Taff Vale, 89½ cents—both little roads. Among the great railroads we find these expenses to have been: London & Northwestern, 64½ cents; Midland, 57½; Great Western, 58; London, Chatham & Dover, 71; Southwestern, 69; Southeastern, 69. The last three are chiefly passenger roads. In most cases the cost per train mile differs not more than two cents from the cost in 1884. The Metropolitan District, one of the underground roads, cost 77 cents per train mile.

In the *Revue Générale des Chemins de Fer* for February is a note by MM. Piéron and Gasmer, respectively Chief Engineer and Inspector of Permanent Way of the Northern Railroad of France, on the economy resulting from good ballast. The result of tabulation of time spent in keeping up track showed an average of 50 per cent. saved by first-class ballast over bad ballast, and for the track considered this amounted to 100 days' time per annum saved per kilometre of track, costing 350 francs, which, capitalized at 5 per cent., would allow the expenditure of 7,000 francs per kilometre, or \$2,333 per mile for improving track from ordinary condition to first-class order; that is, changing from dirty gravel on a wet bottom to screened gravel on a well-drained bottom.

These results are the average of 18 sections of track aggregating 136 miles in length, and with four to 37 regular trains a day in each direction.

The track which carried four trains was laid with 65 lbs. steel, and the saving of time by using first-class instead of fair ballast was 57 days out of 139 per kilometre, while on the track carrying 37 regular trains a day the saving was for first-class ballast, as compared with a poor article, 87½ days out of 190, the weight of rail being the same.

A striking feature of these statistics is the fact that there is about as much proportional saving in the expense of maintenance on roads of light traffic as on those with a large business. The advantage to the former would, therefore, be really greater than to the latter in percentage of total expenses saved.

The above does not take into account the saving in wear and tear of rolling stock. It presupposes the track to be maintained in equally good order in each case, but it is well known that with a poorly ballasted track no amount of labor will keep it in first-class order, and therefore there is a large element of saving to rolling stock and in cost of motive power where good ballast is used, which is in addition to the above figures.

General Railroad News.

MEETINGS AND ANNOUNCEMENTS.

Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Galveston, Harrisburg & San Antonio, annual meeting, at the office, No. 29 Sears Building, Boston, at 11 a. m. on July 6.

Nashville, Chattanooga & St. Louis, annual meeting, in Nashville, Tenn., Sept. 15. Transfer books closed June 16.

Oregon Railway & Navigation Co., adjourned annual meeting, in Portland, Oregon, July 8.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Delaware, Lackawanna & Western, 1½ per cent., quarterly, payable July 20, to stockholders of record on July 30.

Evansville & Terre Haute, 1 per cent., payable July 1, to stockholders of record on June 19.

Housatonic, 3 per cent., semi-annual, on the preferred stock, payable July 10, to stockholders of record on June 30.

Long Island, 1 per cent., quarterly, payable Aug. 2, to stockholders of record on July 10.

Mineral Range, 2½ per cent., quarterly, payable July 5, to stockholders of record on June 30.

New York Central & Hudson River, 1 per cent., quarterly, payable July 15, to stockholders of record on June 30.

Norwich & Worcester, 4 per cent., semi-annual, payable July 10, to stockholders of record on July 1.

Pittsburgh, Fort Wayne & Chicago, 1½ per cent., quarterly, payable on special stock July 1, on regular stock July 6.

Richmond & Petersburg, 2½ per cent., semi-annual, payable July 1.

Woodruff Sleeping & Parlor Coach Co., 1½ per cent., quarterly, payable July 1.

Railroad and Technical Conventions.

Meeting and conventions of railroad associations and technical societies will be held as follows:

The *American Society of Civil Engineers* will hold its

annual convention in Denver, Col., beginning on Friday, July 2.

The *Southern Railway & Steamship Association* will hold its annual convention at the National Hotel in Washington, on Wednesday, July 14.

The *General Baggage Agents' Association* will hold its half-yearly meeting at Niagara Falls, N. Y., on Wednesday, July 21.

Baltimore & Ohio Employees' Relief Association.

The May sheet of this Association shows the payment of benefits during the month, as follows: Main Stem, Transportation Department, 143; Machinery Department, 220; Road Department, 101; Baltimore & Philadelphia, 5; Trans-Ohio divisions, 225; Pittsburgh Division, 90; physicians' bills, 137; total, 921. The payments include five death benefits of \$1,000 each.

Secretary S. R. Barr has issued the following notice: "The attention of members who have married since becoming contributors to this Association, and who have not changed their applications to make the benefits in case of death payable to their wives, is respectfully invited to the desirability of making such changes. Several cases of death have occurred where the beneficiary was other than the wife, and the money has been paid, as required by law, to the beneficiary named in the application.

"While this action on the part of the management is done with much regret, it cannot be avoided unless members sufficiently interest themselves to have the beneficiary changed while they are in health.

"In some cases it is noted that the importance of naming a near relative is overlooked, applicants naming a society, church, or a person no wise related to them. Such members usually do not expect that the beneficiary named will ever derive any consideration from their act, but in so doing they do not fairly realize the vicissitudes of life, or the (in greater or lesser degree) danger of their occupations.

"The earnest attention of both these classes is invited to the importance of naming some one, preferably the nearest blood relation, who would be the most benefited in the event of death occurring while they are members of this Association.

"While members are earning wages this change can be made by obtaining the proper blank from the Secretary of this Association, and returning it to him after proper execution."

ELECTIONS AND APPOINTMENTS.

Atlantic & North Carolina.—At the annual meeting at Morehead City, N. C., June 24, the following directors were chosen: By the private stockholders, Arnold Borden, John Gatling, Eugene Morehead, James A. Pridgen; by the state of North Carolina, Washington Bryan, W. S. Chadwick, W. H. H. Cobb, Paul F. Faison, C. E. Foy, W. C. Stronach, Dempsey Wood, John F. Wooten. The board re-elected Washington Bryan President; F. C. Roberts, Secretary and Treasurer; S. L. Dill, Auditor; W. Dunn, Superintendent.

Bismarck & Southeastern.—The following have been chosen officers of this new company: President, Byron Towne, Minneapolis, Minn.; Vice-President and General Manager, O. P. Bowe, Minneapolis, Minn.; Secretary, Mr. R. Ellis, Minneapolis, Minn.; Attorneys, Albert Phelan, Chicago; George W. Jenkins, Aberdeen, Dakota.

Cincinnati, Hamilton & Dayton.—Mr. Charles H. Rockwell is appointed General Passenger and Ticket Agent of this company and its leased lines, vice Samuel Stevenson, transferred. Mr. George W. Lishawa is appointed Auditor of this company and leased lines, vice Charles H. Rockwell, transferred. These appointments took effect July 1.

Dayton & Chicago.—Mr. S. F. Rock is Chief Engineer of this projected road. His headquarters are, for the present, in Dayton, Ohio.

East Tennessee, Virginia & Georgia.—At the meeting of the purchasing bondholders in New York, June 30, the following directors were selected; on the same day at Knoxville they were formally chosen for the reorganized company: Samuel Thomas, C. S. Brice, Samuel Shethar, C. W. Smith, Chas. M. McGhee, Robert Fleming, E. H. R. Lyman, Frank Work, J. G. Moore, O. H. Payne, A. D. Julliard, J. O. Moss, Henry Fink, E. J. Sandford and R. H. Richards. The board selected Samuel Thomas, President; Henry Fink, Vice-President and Controller of Traffic; James G. Mitchell, Secretary and Treasurer.

Halstead, Kanopolis & Pacific.—The directors of this new company are: D. T. Ruth, D. A. Marshall, J. W. Tibbott, H. D. Markel, W. V. Swezey, E. J. Bookwalter, S. J. Hildreth. Office in Halstead, Kansas.

Kansas City, Memphis & Birmingham.—Mr. John S. Foster, of Tuscaloosa, Ala., has been appointed Assistant Engineer and placed in charge of a locating party in the field. Mr. Frank J. Aid, of Columbus, O., formerly of the Columbus & Eastern Railroad, has been appointed Assistant Engineer and placed in charge of a locating party on the Western Division, in place of Mr. T. S. Newcomb, who has been transferred to the Eastern Division.

Massachusetts Railroad Commission.—The Governor of Massachusetts has appointed Mr. Everett A. Stevens Railroad Commissioner for another term. Mr. Stevens has served one term, having been first appointed by Gov. Butler in 1883.

New York Arcade.—At a meeting held in New York, June 30, the following directors were chosen: Chester A. Arthur, E. B. Austin, Cornelius N. Bliss, George Cecil, Thomas Cornell, B. F. Dunning, James Gillfillan, Alfred M. Hoyt, John O'Brien, Henry Sanford, Melville B. Smith, Edward B. Thomas, Wm. H. Wickham. This is the company which purposes building an underground railroad under Broadway in New York City.

Pana & Roadhouse.—The directors of this new company are: J. C. Essick, Wm. E. Hayward, L. Schlierback, S. C. Waggoner, Charles J. White. Office in Pana, Illinois.

St. Paul, Minneapolis & Manitoba.—Mr. William E. Smith has been appointed General Solicitor of this company, and will take charge of his office about July 15. Mr. Smith is a lawyer of high standing, and has been for some time Assistant Secretary of the Treasurer, which position he resigned to accept his new office.

Sea View.—The directors of this new company are: J. M. Bon, Felix Campbell, Joseph Fahys, James Jourdan, James Johnson, A. R. Johnson, E. L. Langford, J. L. Morrow, Wm. Richardson, F. A. Schroeder, Alonzo Slote, D. H. Valentine, Charles V. Van Doren. The board has elected F. A. Schroeder, President; J. M. Bon, Treasurer; J. L. Morrow, Secretary and Superintendent. The company owns the elevated railroad at Coney Island.

Silver Springs, Ocala & Gulf.—At the annual meeting in Ocala, Fla., June 15, directors were elected as follows:

Thomas C. Hoge, Oscar Tamango, James T. Van Rensselaer, Dr. J. B. Upham, Alexander C. Quarries, New York; E. W. Agnew, Ocala, Fla.; R. F. Taylor, Gainesville, Florida.

Wheeling & Lake Erie.—The directors of this new company, organized by the bondholders who bought the Wheeling & Lake Erie road at foreclosure sale, are: P. F. Berdan, George W. Davis, S. C. Reynolds, M. D. Woodford, Toledo, O.; Daniel E. Garrison, St. Louis; Melville C. Day, George J. Forrest, New York. The board has elected George J. Forrest President; Daniel E. Garrison, Vice-President; M. D. Woodford, General Manager.

PERSONAL.

—Mr. Chauncey M. Depew, President of the New York Central & Hudson River Co., sailed from New York, July 1, on a short vacation trip to Europe.

—Mr. W. H. Hutchins has resigned his position as Commercial Agent of the Wabash, St. Louis & Pacific road at Kansas City, Mo., to take effect July 1 and will go into other business.

—Mr. John S. Bartlett, for nine years past General Northern Passenger Agent of the New York, Lake Erie & Western road, with headquarters at Buffalo, has tendered his resignation, to take effect July 1.

—Mr. Julius Wadsworth, of New York, has resigned his position as Vice-President of the Chicago, Milwaukee & St. Paul Co., on account of ill health. The board has not yet acted on his resignation. Mr. Wadsworth has been a director of the company for a number of years and has been Vice-President for 11 years past.

—Mr. James D. Schuyler, recently Chief Engineer of the Sinaloa & Durango Railroad in Mexico, is now General Manager of a water and land company in California, which purposes improving an extensive tract of land in that state by irrigation. Mr. Schuyler made a creditable record in Mexico under very adverse circumstances.

—Mr. Orrin Hamilton, a conductor on the Boston & Maine road, has this week completed 39 years of continuous service in the employ of that company. The greater part of that period he has run on a through train between Boston and Portland. Mr. Hamilton has been exceptionally fortunate, not a single passenger having been killed or fatally injured on any train run by him through this long period.

—A dispatch from Dallas, Tex., says that Mr. A. A. Egbert has resigned his position as General Superintendent of the Texas & Pacific road on account of failing health. Mr. Egbert expects to remove to a northern climate in the hopes that his health will be restored. He served for a number of years on the Burlington & Missouri River Railroad in Nebraska as Roadmaster, and afterward as Roadmaster and Division Superintendent on the Union Pacific. After a short service as Division Superintendent of the Atchison, Topeka & Santa Fe he returned to the Union Pacific, and was General Superintendent of the Colorado Division, which position he left to go to the Texas Pacific some two years ago.

—A Philadelphia dispatch of June 30 says: "The disappearance of J. A. L. Wilson, Treasurer of the Chesapeake & Delaware Canal Co., from his desk this morning brought to light the most gigantic defalcation that has occurred in the city for a long time. He left behind him an over-issue of bonds that \$600,000 will not cover. The facts are these: The company created a 6 per cent. loan in 1886 for 30 years, which was due to-morrow, and arrangements had been made for extending it at 5 per cent. When President Gillingham sent for Wilson about 10 o'clock this morning to talk over business affairs, word was returned to him that the Treasurer had not yet reported for duty. In looking over his mail he found a letter from Wilson which in substance informed him that instead of the loan standing at \$1,975,000, the exact amount had been extended by him to \$2,592,264. He confessed having made the over-issue over a year ago. This afternoon President Gillingham said that while the loss was very heavy, it will not affect the standing or credit of the company, and that every effort would be made to apprehend Wilson. The defaulter has been in the employ of the company for 30 years. He worked his way up and had the entire confidence of the directors and had been Treasurer for three years. The amount in cash taken from the safe yesterday by him was \$40,000. Three years ago the former Secretary and Treasurer, H. H. Leslie, was discharged because of a shortage in his accounts of \$15,000. Prior to leaving the city, Wilson retained a prominent lawyer as counsel in case he should be arrested. On the marriage of his daughter recently he presented her with a spacious and elegantly fitted house at Wayne station, on the Pennsylvania Railroad."

TRAFFIC AND EARNINGS.

Cotton.

Cotton movement for the week ending June 25 is reported as follows, in bales:

	1886.	1885.	Inc. or Dec.	P. c.
Interior markets:				
Receipts.....	9,925	3,804	I. 4,121	147.2
Shipments.....	15,367	6,775	I. 8,592	126.3
Stock, June 25.....	96,032	35,972	I. 60,060	166.5
Seaports:				
Receipts.....	14,361	2,155	I. 12,206	551.6
Exports.....	49,756	32,786	I. 16,970	51.4
Stock, June 25.....	388,558	320,021	I. 67,667	21.1

The total movement from plantations for the crop year to June 25 is estimated at 6,425,026 bales, against 5,582,127 last year, 5,615,132 in 1883-84, and 6,883,389 in 1882-83.

Coal.

Coal tonnages for the week ending June 19 are reported as follows:

	1886.	1885.	Inc. or Dec.	P. c.
Anthracite.....	675,105	657,583	I. 17,622	2.4
Eastern bituminous.....	296,993	220,110	I. 46,886	21.3
Coke.....	71,062	53,610	I. 18,052	33.4

The anthracite market is dull, and prices are low, on reports that heavy stocks are accumulating at tidewater.

The bituminous trade is more active, and large shipments may be expected for some weeks to make up deficiencies in contracts during the weeks when shipments were stopped by strikes.

Cumberland coal shipments for the week ending June 26 were 78,979 tons. Total to June 26 this year, 741,316; last year, 1,268,394; decrease, 527,078 tons, or 41.6 per cent.

Southern Passenger Committee.

The Southern Passenger Committee held a meeting in Asheville, N. C., June 24, at which a large amount of routine business was transacted. Special rates were granted to a number of conventions and religious gatherings.

A resolution was passed with a view of securing the general encampment of the Grand Army of the Republic for 1887 at Nashville, Tenn., to the effect that a rate of 1 cent per mile be granted for members of the Grand Army and their families, the excursionists to have the option of return-

ing by different routes if they desired. It was also voted to authorize a rate of 1 cent per mile on excursions to old battlefield points.

Indianapolis Car Movement.

The number of cars received and forwarded at Indianapolis has been:

	May 29.	June 5.	June 12.	June 19.	June 26.
1886—Total.....	18,950	18,588	18,587	18,672	17,577
Loaded.....	14,321	13,866	13,735	13,617	12,455
1885—Total.....	18,271	18,750	.....	17,962	17,146
Loaded.....	13,845	14,321	.....	13,436	13,161

The decrease from the preceding week was wholly in through business, east-bound traffic especially showing a decrease. There was also a lighter lumber movement.

Railroad Earnings.

Earnings of railroad lines for various periods are reported as follows:

	Six months to June 30:	1886.	1885.	Inc. or Dec.	P. c.
Lake Sh. & Mich.		\$6,951,786	\$6,487,654	I. \$464,132	7.2
Southern.....		2,469,689	1,899,538	I. 570,151	30.0
Mich. Central.....		5,436,000	4,973,000	I. 463,000	9.3
Net earnings.....		1,484,000	1,087,000	I. 397,000	86.4
N. Y. Cen. & H. R.		14,848,201	11,565,858	I. 3,282,343	28.4
Net earnings.....		5,503,840	3,679,778	I. 1,824,062	49.3

Five months to May 31:

Buff. N. Y. & P.	\$974,076	\$871,884	I. \$102,192	11.7
Net earnings.....	150,150	169,760	D. 19,610	11.5
E. Ten. Va. & G.	1,570,989	1,617,549	D. 46,560	2.9
Net earnings.....	376,584	366,572	I. 10,012	2.7
Georgia Pacific.....	258,680	259,493	I. 813	15.0
Mobile & Ohio.....	721,892	808,212	D. 86,320	10.7
Net earnings.....	116,653	138,555	D. 21,902	15.8
N. Y. Cen. & H. R.	12,248,367	9,592,942	I. 2,655,425	27.6
N. Y. Sus. & W.	419,731	405,894	I. 13,837	3.4
N. Y. L. E. & W.	6,086,964	5,891,967	I. 1,094,997	18.5
Net earnings.....	2,250,832	1,523,947	I. 726,885	47.7
N. Y. P. & Ohio.....	2,327,307	1,932,716	I. 394,591	20.4
Net earnings.....	741,750	449,434	I. 292,316	64.9
Northern Central.....	2,149,864	2,181,552	D. 31,688	1.5
Net earnings.....	803,912	907,104	D. 103,282	11.4
Northern Pacific.....	3,910,900	3,563,924	I. 316,976	8.8
Net earnings.....	1,610,969	1,355,894	I. 255,066	18.8
Phila. & Reading.....	10,888,354	10,281,909	I. 606,445	5.9
Net earnings.....	4,049,557	3,775,701	I. 273,856	7.2
St. Jo. & Gd. I.	458,906	429,287	I. 29,619	6.9
Net earnings.....	215,386	117,326	I. 98,060	82.8
West Jersey.....	430,258	369,745	I. 30,513	7.6
Net earnings.....	130,086	135,724	D. 5,638	4.1

Four months to April 30:

Maine Central.....	\$860,011	\$823,504	I. \$36,507	4.4
Net earnings.....	279,441	269,575	I. 9,866	3.6
Month of April:				
Ft. Worth & D.	\$34,147	\$30,923	I. \$3,224	10.4
Net earnings.....	14,372	12,008	I. 2,364	19.7
Maine Central.....	243,285	233,021	I. 10,264	4.4
Net earnings.....	99,076	97,428	I. 1,648	1.7
N. Y. Cen. & H. R.	2,363,544	1,816,324	I. 547,220	36.1

Month of May:

Buff. N. Y. & P.	\$213,332	\$193,417	I. \$19,915	10.3
Net earnings.....	20,021	46,002	D. 25,981	56.5
E. Ten. Va. & G.	284,152	276,871	I. 7,281	2.6
Net earnings.....	40,655	25,874	I. 14,781	56.9
Georgia Pacific.....	47,484	43,883	I. 3,601	8.2
Mobile & Ohio.....	134,762	122,653	I. 12,109	9.6
Net earnings.....	3,330	5,806	D. 9,136	2.6
N. Y. L. E. & W.	1,601,735	1,230,856	I. 370,879	30.1
Net earnings.....	606,208	363,653	I. 242,555	66.7
N. Y. P. & Ohio.....	514,915	368,700	I. 146,215	39.6
Net earnings.....	185,226	6,648	I. 116,578	108.9
N. Y. Cen. & H. R.	2,542,622	1,814,395	I. 728,227	40.1
N. Y. Sus. & W.	87,204	85,294	I. 1,910	2.2
Northern Cen.	454,917	454,917	D. 7,681	1.7
Net earnings.....	147,485	183,470	D. 35,985	19.6
Northern Pacific.....	934,731	901,101	I. 33,630	9.2
Net earnings.....	504,395	438,156	I. 66,239	15.1
Oreg. P. & Co.	480,345	439,461	I. 40,884	41.4
Net earnings.....	230,385	143,431	I. 86,954	60.8
Phila. & Reading.....	2,409,440	2,377,423	I. 32,017	1.4
Net earnings.....	973,470	953,433	I. 20,037	2.1
St. Jo. & Gd. I.	80,681	67,429	I. 22,252	32.9
Net earnings.....	35,682	8,278	I. 27,404	335.0
West Jersey.....	104,326	96,008	I. 8,318	8.6
Net earnings.....	17,049	35,660	D. 18,611	51.7

Second week in June:

Cairo, V. & C.	\$13,966	\$6,421	I. \$7,545	117.0
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Third week in June:

Buff. N. Y. & P.	\$19,658	\$24,783	D. \$5,125	26.6
Canadian Pac.	507,000	165,000	I. 42,000	25.5
Chi. & Alton.....	163,364	153,460	I. 9,904	6.3
Chi. & East Ill.	34,128	33,084	I. 1,044	3.2
Chi. Mil. & St. P.	472,000	421,049	I. 50,951	12.1
Col. & N. W.	474,000	440,100	I. 24,900	5.5
Ch. St. P. M. & O.	119,500	107,500	I. 12,000	11.2
C. I. St. L. & C.	42,881	41,503	I. 1,378	3.3
Ill. C. ntral.....	198,000	196,745	I. 1,255	0.9
Iowa lines.....	36,000	36,465	D. 465	1.3
Long Island.....	74,580	77,890	D. 3,310	4.3
Louisv. & Nash.	252,780	232,025	I. 20,755	8.0
Mil. L. S. & W.	53,770	23,540	I. 30,230	128.2
Mil. & Northern.....	11,325	11,054	I. 271	2.5
St. L. & San F.	80,800	73,939	I. 6,861	9.3
Wab. St. L. & P.	226,000	169,000	I. 57,000	33.7

* Deficit.

New York Central & Hudson River earnings, as given above, include the earnings of the West Shore road in 1886, but not in 1885.

Weekly earnings are usually estimated in part, and are subject to correction by later statements. The same remark applies to early statements of monthly earnings.

Cedar Rapids Association.

The earnings on traffic in this Association for the six months from Nov. 1 to April 30 were:

	West-bound.			East-bound.		
	Tons	Revenue.	P. c.	Tons.	Revenue.	P. c.
Bur., C. R. & N.	10,308	\$4,733	45.5	417	\$2,292	30.0
Chl. Mil. & St. P.	7,670	20,821	23.2	476	2,205	26.3
Chi. & Northwest.	7,741	28,038	31.3	598	3,335	40.7
Totals.....	25,719	\$80,592	100.0	1,431	\$7,632	100.0

The agreement of the city of Cleburne to purchase right of way and depot grounds for the company contemplates an

Haverhill & Lawrence.—At a meeting held in Haverhill, Mass., June 28, it was decided to build a railroad from that town to Lawrence, to connect with the Lawrence branch of the Boston & Lowell road. The road will be about 7 miles long, and its estimated cost is about \$500,000. Over one-half this amount was subscribed at the meeting, and a committee was appointed to organize a company and take other necessary preliminary steps.

Housatonic.—This company has put on its line several trains intended to accommodate the travel between New York and the summer resorts among the Berkshire hills. The trains include one fast express, which makes the run from Bridgeport to Pittsfield (110 miles) in about 3 hours, making the time from New York to Pittsfield a little less than 5 hours. This train carries through cars from New York to Pittsfield.

Indiana, Bloomington & Western.—The Supreme Court of Ohio has overruled the motion made by this company for a rehearing or a modification of the decree recently granted in the suit of the Cincinnati, Sandusky & Cleveland Co. against this company. The suit, it will be remembered, was in relation to the interpretation of the lease, and the decision of the Supreme Court awarded the Cincinnati, Sandusky & Cleveland Co. a larger amount than has been heretofore paid by the lessee.

Kansas City, Memphis & Birmingham.—There are now eight parties of engineers in the field locating this line. On the Western Division the line has been finally decided on for 25 miles out of Memphis, Tenn., and contracts will probably soon be let for the grading. On the Eastern Division contracts for 80 miles of grading have been let, including one section of heavy rock work. The contractors are as follows: Dunavant & Kelly, of Memphis, Tenn., 35 miles; Lee & Garvey, of Memphis, 10 miles; Fudge & Kearn, of Memphis, 10 miles; George Arnold & Co., of Memphis, 25 miles. Dunavant & Kelly have already a large force at work.

Kansas Midland.—This company has been organized to build a railroad from Red Cloud, Neb., on the Burlington & Missouri River Railroad, southwest to Wichita, Kan. The chief projectors of the line are Mr. W. G. Dacey and Mr. A. A. Phipps, of Boston.

Lake Shore & Michigan Southern.—The following statement for the half-year ending June 30 (June earnings estimated) is published:

	1885.	1886.	Inc. or Dec.	P. c.
Earnings.....	\$6,951,786	\$6,487,654	I. \$464,032	7.1
Expenses.....	4,482,697	4,588,16	D. 106,019	2.3
Net earnings.....	\$2,469,089	\$1,899,538	I. \$570,151	30.0
Charges.....	1,920,000	1,931,728	D. 11,728	0.7
Surplus.....	\$549,089	\$967,810	I. \$418,721	76.3
Per cent. of exps.	64.5	70.7	D. 6.2	...

* Deficit.

The net earnings this year were about 1.1 per cent. on the stock. The contribution to sinking fund was \$125,000, being a balance of \$424,689.

The strike of the switchmen at Chicago stopped all freight traffic there for several days, and was accompanied by some violence, several freight trains having been derailed and force used to prevent trains from being sent out. The principal point where trains were stopped was outside of the city, and no efficient protection could be obtained from the county or state authorities. On June 29 the company finally secured police protection and succeeded in sending out several freight trains, and at the present writing freight trains are running, but strong guards are required to prevent them from stoppage by the strikers and their friends.

Lehigh Valley.—The great Vosburg tunnel on this company's Pennsylvania and New York line, 35 miles from Wilkes-Barre, Pa., has been completed, and was formally opened June 26, when a special train took up to the tunnel a number of officers of the company and invited guests. The tunnel is about 4,000 ft. long, and work has been in progress upon it for nearly three years. The road follows the course of the East Branch of the Susquehanna at this point, and the old line is exceedingly circuitous and difficult to operate and maintain. The tunnel carries the road through a mountain, the new line running straight across at a point where the river makes a long bend. It shortens the road about four miles, and avoids a number of sharp curves. The cost of the tunnel and approaches has been about \$1,000,000, but it is expected that the saving in expenses will fully compensate for this extra outlay.

Little Rock & Fort Smith.—It is reported that arrangements are completed for the commencement of work on the extension of this road from Fort Smith, Ark., northwest, through the Indian Territory, to a connection with the Atchison, Topeka & Santa Fe line in Southern Kansas.

Little Rock & Hot Springs.—This company has filed articles of incorporation to build a railroad from Little Rock, Ark., west by south to Hot Springs, a distance of about 50 miles. It is the fifth or sixth company which has been organized for this purpose.

Louisville & Nashville.—This company has agreed to extend its Bardstown branch from Bardstown, Ky., southwest to Springfield, about 17 miles, the work to be completed this year. The company is to receive the right of way and a bonus of \$30,000, and parties interested agree to take \$170,000 in bonds issued on the new road. The extension will be built under the old charter of the Cumberland & Ohio, and a portion of it will be upon the road-bed graded by that company several years ago.

Maine Central.—The statement for April and the four months to April 30 is as follows:

	1885.	1886.	1887.	1888.
Earnings.....	\$243,285	\$233,021	\$860,011	\$873,504
Expenses.....	144,209	135,593	580,570	553,929
Net earnings.....	\$99,076	\$97,428	\$279,441	\$269,575

For the four months the gross earnings increased \$36,507, or 4.4 per cent., and the expenses \$26,641, or 4.8 per cent., leaving a gain of \$9,866, or 3.6 per cent., in net earnings.

Manhattan.—Notice is given that the privilege is offered to all shareholders of record of this company, on July 6, 1886, of participating in a contract of purchase of stock and bonds of the Suburban Rapid Transit Co., from the New Jersey Railway Construction Co., which has undertaken the construction of part of the lines of the Suburban Co. Each of said stockholders can take an amount of stock of the Suburban Railway Co., and an equal amount of the bonds of the Suburban Co., paying for the same in instalments as the work progresses.

Mexican Railroad Notes.—The following notes are from the *Mexican Financier* of June 19:

Complaint is made by Mazatlan papers that the Sinaloa & Durango Co. is not fulfilling its engagements. It is probable that the company is doing all that it can, and, with the revival of business, we may fairly expect active construction to re-begin on this line.

A project is under discussion in the state of Michoacan,

looking to the connection by railway of the towns of Uruapan, Taretan, Ario and Tacámbaro, all centres of rich agricultural districts. It is believed by the promoters of this scheme, and with good reason, that such a road would earn large profits. The success of the Morelos road, which taps a richly productive country, is an indication of the profit to be obtained in the connecting of fertile agricultural regions with the already established railway system. The key to the future material progress of the country lies in cheap and facile communication accompanied by a system of taxation reform which will do away with petty local taxes that so heavily burden exportation.

On June 14, preliminary surveys were begun on the railroad which will connect Venta Hermosa, a point on the Mexican Central, with Zimapan, the iron mining centre. A noteworthy fact about this railroad is that it is being built entirely with private means, no subvention being asked for or given by the government. The proprietors are Messrs. C. Eisenmann and Lionel Samuel. The line is being built and will be managed by Mr. Samuel, and the engineer in charge is Mr. J. M. Velasquez. At present about 20 miles will be built, the continuation to Zimapan, some fifty miles further, being left for completion later on. This road will tap a richly wooded country, capable of furnishing a very large quantity of ties to the Central and will give a good amount of freight. The fact that the enterprise in question is wholly a Mexican one adds to cumulative evidence that home capital is disposed to enter railway construction wherever a fair return for the money invested can be had.

Michigan Central.—The following statement is published for the half-year ending June 30, June earnings estimated:

	1885.	1886.	Inc. or Dec.	P. c.
Earnings.....	\$5,436,000	\$4,973,000	I. \$463,000	8.3
Expenses.....	3,932,000	3,886,000	I. 66,000	1.7
Net earnings.....	\$1,484,000	\$1,087,000	I. \$397,000	36.4
Charges.....	1,290,000	1,320,000	D. 30,000	2.3
Surplus.....	\$194,000	\$767,000	I. \$573,000	294.8
Per cent. of exps.	72.7	78.1	D. 5.4	...

* Deficit.

By retirement of bonds in 1885, the Michigan Central annual interest charge was reduced \$102,160 from the amount stipulated in the traffic agreement with the Canada Southern Co., and by one of its conditions the Michigan Central is entitled to the benefit of any such reduction. For six months this is \$51,000, which deducted from the total surplus before the division is made leaves \$142,920, and one-third of that to the Canada Southern is \$47,640.

Minneapolis, Sue Ste. Marie & Atlantic.—A branch about 15 miles long is to be built from a point on this road near Bruce, Wis., into the pine woods. The branch will be built by parties interested in lumber property in that part of Wisconsin, and will serve as an important feeder to this road.

Minnesota & Northwestern.—The St. Paul *Pioneer-Press* of recent date says: "President Stickney has let the contract for grading the Minnesota & Northwestern from Freeport to Chicago, a distance of about 100 miles, to Shepard, Winston & Co., and expects to have the road in running order to Chicago by the first of next season. This will then leave only a gap of 68 miles in his road to Chicago, between Dubuque and Freeport. He will use the Illinois Central between these points until arrangements are perfected for the complete through line. The road now projected will run east from Freeport, south of the Freeport line of the Northwestern, to a point near Elgin, where that road will be crossed. The line will then proceed east and south, crossing the main line of the Northwestern near Lombard, about 20 miles from Chicago, and will run parallel and near to it to a junction with the Wisconsin Central, about 9½ miles west of Chicago. The terminal facilities of the latter road will probably be used for the present until others can be secured. The large towns through which the new line will pass are Sycamore, St. Charles, Holcomb and Byron. Arrangements are now being made for securing the right of way for the proposed line."

Missouri Pacific.—The St. Louis House of Delegates has passed a bill giving to the St. Louis, Iron Mountain & Southern Co., which in this case is merely another name for the Missouri Pacific, the exclusive right to build an elevated railroad from the St. Louis end of the bridge over the Mississippi to the Union Depot. The popular feeling is said to be very strongly against this grant, the people generally not objecting so much to the building of the road as to the grant of the exclusive right to the Missouri Pacific Co.

Mobile & Ohio.—The statement for May and the eleven months of the fiscal year from July 1 to May 31 is as follows:

	1885.	1886.	1887.	1888.
Earnings.....	\$134,762	\$122,633	\$1,862,276	\$1,892,239
Expenses.....	131,432	128,450	1,345,451	1,451,893
Net earnings.....	\$3,330	\$9,183	\$516,825	\$440,346

* Deficit.

For the eleven months the gross earnings decreased \$129,969, or 6.5 per cent., and the expenses \$106,442, or 7.3 per cent., leaving a decrease of \$23,521, or 4.4 per cent., in net earnings.

Newport News & Mississippi Valley Co.—It is announced that this company has leased the Chesapeake & Ohio Railroad, as noted elsewhere. This company now leases lines extending from Newport News to Memphis, and will shortly, it is understood, add to these the line from Memphis to New Orleans.

New York Central & Hudson River.—This company has begun the publication of its gross earnings monthly, the only statements issued heretofore having been the quarterly reports required by the Railroad Commission. This statement for May is as follows:

	1885.	1886.	1887.	1888.
Quarter to March 31.....	\$7,342,201	\$5,962,232	\$1,379,979	23.1
April.....	2,363,544	1,816,324	547,220	30.1
May.....	3,542,622	1,814,390	728,226	40.1

Total, 5 months..... \$12,248,367 \$9,592,942 \$2,655,425 27.6

The earnings of the West Shore road are included in the statement this year, but not in the figures for 1885.

An approximate statement submitted to the board gives the following figures for the quarter ending June 30 and the nine months from Sept. 1 to June 30, comparisons being made with the actual figures for last year:

	1885.	1886.	1887.	1888.
Earnings.....	\$7,506,000	\$5,803,634	\$21,724,802	\$18,376,026
Expenses.....	4,588,000	3,878,863	13,479,569	11,819,165
Net earnings.....	\$2,918,000	\$1,924,771	\$8,245,233	\$6,556,861
Charges.....	1,926,000	1,485,000	5,319,000	4,470,000
Surplus.....	\$992,000	\$439,771	\$2,926,233	\$2,086,861

Here also the West Shore earnings are included this year (from Dec. 5, 1885), but not last year. On this showing the directors decided to make the quarterly dividend 1 per cent.,

which will require \$894,283, leaving a balance of \$97,717. This makes the dividends for the nine months 3 per cent., or \$2,682,849, leaving a surplus of \$243,384 on hand.

New York, Lake Erie & Western.—The Rochester (N. Y.) *Democrat and Chronicle* of June 25 says: "The Erie purposes making its terminal in this city a credit to the company, and is working to do a business that will be not only large but profitable. Plans have been drawn, on which several contractors have made bids, for a new freight depot on Exchange street, and Chief Engineer Buckholz has the bids and it is expected that a contract will be awarded this week. The depot is to be of brick, 300 ft. long and 118 ft. wide, with 45 ft. as its greatest height. It will be located 14 ft. back from the curb on Exchange street and 22 ft. from the south wall of the jail. It will extend along Exchange street to within 180 ft. of the present Erie station. The rear wall will be nearly in line with the rear wall of the jail. The Hollister lumber yard, which now occupies the site of the structure, will be removed to the opposite side of Exchange street. A double track will run into the freight house entering at the southern end, and the cars are to be loaded and unloaded from platforms at either side of the space occupied by the tracks. A second story at the northern end of the edifice will be occupied by offices—a general office, 28 by 31 ft., for freight clerks, and two smaller offices, 14 by 19 ft., to be occupied by the freight agent. Work has already been begun upon a wooden trestle bridge across the mill-race to connect the tracks of the Erie with the new station in course of erection on Court street. Work on this station is progressing rapidly. The cellar walls are on a level with the surface of the ground and the joists for the building were laid yesterday. It is expected that both freight and passenger stations will be completed before Oct. 1."

The statement for May and the eight months of the fiscal year from Oct. 1 to May 31 is as follows, the figures including 68 per cent. of the gross earnings and all the working expenses of the leased New York, Pennsylvania & Ohio road:

	1885.	1886.	1887.	1888.
Earnings.....	\$1,951,877	\$1,481,613	\$14,335,604	\$12,347,795
Expenses.....	1,325,216	1,167,315	10,288,018	9,527,792
Net earnings.....	\$626,661	\$314,298	\$4,047,586	\$2,819,923

For the eight months the gross earnings increased \$1,987,809, or 16.1 per cent., and the expenses \$760,146, or 7.9 per cent., leaving a gain in net earnings of \$1,227,663, or 43.5 per cent.

The statement for the Erie lines proper, excluding all earnings and expenses of the leased road, is as follows:

	1885.	1886.	1887.	1888.
Earnings.....	\$1,601,735	\$1,230,856	\$11,687,289	\$10,037,366
Expenses.....	995,527	867,203	7,679,620	7,147,505
Net earnings.....	\$606,208	\$363,653	\$4,007,669	\$2,889,861

This statement shows for the eight months an increase in gross earnings of \$1,649,923, or 16.4 per cent., and an increase in expenses of \$532,115, or 7.4 per cent., leaving a gain in net earnings of \$1,117,808, or 38.7 per cent.

A comparison of the two statements shows that for the eight months of this year the 68 per cent. of the gross earnings of the New York, Pennsylvania & Ohio amounted to \$2,648,315, and its working expenses to \$2,608,398, leaving a profit on the lease of \$39,917, against a loss of \$69,938 for the corresponding period last year.

New York, Ontario & Western.—This company is preparing plans and specifications for a tunnel through the divide between the Delaware and Susquehanna at a point near Franklin, N. Y. This tunnel will be about 1,500 ft. in length, and will shorten the line some 2 miles, besides reducing considerably the maximum grade, which is now 104 ft. to the mile. The estimated cost is about \$500,000. It was originally intended to build a tunnel at this point, but owing to lack of funds a switchback was built over the mountain, which has been used ever since.

Northern Central.—The statement for May and the five months to May 31 is as follows:

	1885.	1886.	1887.	1888.
Earnings.....	\$447,236	\$154,917	\$2,149,864	\$2,181,552
Expenses.....	2,975	271,447	1,345,952	1,274,358
Net earnings.....	\$147,485	\$183,470	\$803,912	\$907,194

For the five months the gross earnings decreased \$31,688 or 1.5 per cent., and the expenses increased \$71,594, or 5.6 per cent., the result being a decrease of \$103,282, or 11.4 per cent., in net earnings.

Northern Pacific.—The Helena & Red Mountain Co. has been incorporated to be built as a branch of this road from Helena, Mont., up Ten Mile Creek to the Red Mountain Mining district. The organization is controlled by the Northern Pacific Co., and work is to be begun at once.

The statement for May and the eleven months of the fiscal year from July 1 to May 31 is as follows:

	1885.	1886.	1887.	1888.
Earnings.....	\$983,731	\$901,101	\$10,663,171	\$10,221,642
Expenses.....	479,336	402,945	5,401,229	5,506,181
Net earnings.....	\$504,395	\$498,156	\$5,261,942	\$4,715,461
Fixed charges.....	546,794	547,974	4,926,931	4,926,931
Deficit.....	...	...	\$216,032	\$211,470

For the eleven months the gross earnings increased \$431,529, or 4.2 per cent., and the expenses decreased \$104,952, or 1.9 per cent., leaving a gain in net earnings of \$536,481, or 11.4 per cent. The fixed charges (rentals, interest and sinking funds) increased \$541,043, or 11.0 per cent., the result being an increase of \$4,564, or 2.2 per cent., in the deficit.

Oregon Railway & Navigation Co.—The annual meeting in Portland, Oregon, which was adjourned from June 21 to June 28, has again been adjourned until Thursday, July 8.

Painesville & Youngstown.—It is understood that the bondholders who recently purchased this road at foreclosure sale have leased it to the Pittsburgh & Western Co., as noted elsewhere.

Pana & Roodhouse.—This company has filed articles of incorporation to build a railroad from Pana, Ill., to the crossing of the Illinois Central and the Indianapolis & St. Louis roads, westward to Roodhouse, on the Chicago & Alton. The road will be about 70 miles long and was projected several years ago.

Philadelphia & Reading.—The Receivers' statements give the following figures for the earnings of the railroad for May and the six months of the fiscal year from Dec. 1 to May 31:

	1885.	1886.	1887.	1888.
Earnings.....	\$2,409,440	\$2,377,423	\$13,480,883	\$12,507,472
Expenses.....	1,435,970	1,423,960	8,244,923	7,900,780
Net earnings.....	\$973,470	\$953,463	\$5,235,960	\$4,606,692

For the half-year the gross earnings increased \$883,411, or 7.1 per cent., and the expenses \$344,143, or 4.4 per cent., leaving a gain in net earnings of \$539,268, or 11.5 per cent. The traffic of the railroad lines is reported as follows:

	May.	1885.	1886.	1885.
Tons coal carried	1886.	1885.	1886.	1885.
Tons merchandise	997,593	1,021,873	5,747,679	5,163,380
Passengers	991,853	721,621	4,957,416	3,659,531
Tons coal on colliers	2,144,821	1,985,504	11,454,465	10,501,669
	50,314	45,085	250,917	263,521

For the month there was a decrease in coal tonnage, but an increase in merchandise and passengers. For the year all traffic showed a gain except the steam collier shipments. The statement for the Philadelphia & Reading Coal & Iron Co. is as follows:

	May.	1885.	1886.	1885.
Earnings	1886.	1885.	1886.	1885.
Expenses	\$1,305,112	\$1,267,175	\$6,466,485	\$6,390,844
Deficit	1,483,955	1,265,691	7,430,262	6,518,891
	\$178,543	\$1,484	\$963,777	\$128,047

* Net.

Here there was for the half-year an increase in gross earnings of \$75,641, or 1.2 per cent., and an increase in expenses of \$911,371, or 14.0 per cent., the result being an increase in the deficit of \$835,730, or 65.2 per cent.

The coal mined from the company's lands was as follows:

	May.	1885.	1886.	1885.
By company	1886.	1885.	1886.	1885.
By tenants	459,305	428,396	2,444,685	2,071,875
Total	43,650	66,519	290,447	336,372
	502,955	494,915	2,635,132	2,408,247

The total increase for the month was 10,040 tons, or 2.0 per cent.; for the half-year, 236,885 tons, or 9.4 per cent.

The joint net earnings of the two companies were:

	May.	1885.	1886.	1885.
Railroad Co., net	1886.	1885.	1886.	1885.
Coal & Iron Co., def.	\$973,470	\$953,433	\$1,215,960	\$4,636,692
Total net	178,543	*1,484	963,777	128,047
	\$794,927	\$954,917	\$4,272,183	\$4,568,645

* Net.

The decrease in total net earnings for the month was \$159,990, or 16.7 per cent.; for the half-year, \$296,462, or 6.5 per cent. The increased loss on the operations of the coal property was sufficient to wipe out the gain in the net earnings of the railroad lines.

As the expenses reported do not include anything for interest or rentals, the net earnings given above are the sums from which all fixed charges are to be provided.

Pittsburgh & Western.—A Pittsburgh dispatch states that the Pittsburgh, Cleveland & Toledo Co., which is controlled and operated by this company, has leased the Painesville & Youngstown road, which was recently sold at foreclosure sale. The Painesville & Youngstown extends from Youngstown, O., to Fairport on Lake Erie. It is now of 3-ft. gauge, but it is to be changed to standard gauge, and will be used as a branch, giving the Pittsburgh & Western a connection with Lake Erie, which is valuable for ore and coal business. In connection with this line it is stated that parties connected with the Pittsburgh & Western Co. have made extensive purchases of lake front property in the vicinity of Fairport.

Work is nearly completed on the branch or extension of this company's narrow gauge division from Mt. Jewett, Pa., to Ormsby, which will connect this division with the Pittsburgh, Bradford & Buffalo and the rest of the system of narrow gauge roads in the Bradford oil district. Tracklaying has been begun, and the rails are reported down for 6 miles.

Rome, Watertown & Ogdensburg.—This company has secured control of the Rochester & Ontario Belt road, which it will use as a branch, connecting its Western Division at Charlotte, N. Y., with Rochester. The company has also purchased property and has begun work on an extension of the Belt road from its present terminus to a more convenient point in the city of Rochester.

St. Augustine & Palatka.—Track is reported laid on this road from a point on the St. Johns River opposite Palatka, Fla., northwest to St. Augustine, a distance of about 30 miles, and the road will shortly be opened for business. It has been built chiefly by Mr. Astor, of New York, and is intended to develop the large tract of land owned by him.

San Antonio & Aransas Pass.—The amount of the issue of bonds on this company's proposed extension from San Antonio, Tex., northwest to the Indian Territory and on the branch to Waco, is \$10,000. These bonds are to bear 6 per cent. interest, have 40 years to run, and will be issued as the road is completed. The capital stock is now fixed at \$5,000,000, having been increased to that amount from \$1,000,000, the amount originally fixed.

The company expects to have its main line of 156 miles from San Antonio to the Gulf at Aransas Pass completed by Sept. 1 next, and the branch of 11 miles to Corpus Christi at the same time. The mortgage upon the main line is \$10,000 per mile in 6 per cent. 30-year bonds.

Sea View.—This company has been organized as successor to the Coney Island Elevated Railroad Co., and owns the elevated railroad extending from West Brighton to Brighton Beach on Coney Island.

Securities on the New York Stock Exchange.—The Governing Committee of the New York Stock Exchange has placed the following securities on the lists:

Columbus, Hocking Valley & Toledo, \$1,000,000 new general mortgage 6 per cent. bonds.

East Tennessee, Virginia & Georgia, \$136,000 divisional 5 per cent. bonds, making a total of \$3,003,000 in all. Also 165,000 shares assessment paid preferred and 275,000 shares assessment paid common stock.

Illinois Central, \$2,500,000 new 3½ per cent. mortgage bonds.

Missouri Pacific, \$3,000,000 additional stock, making the total amount listed \$36,000,000.

St. Louis & Cairo, \$4,000,000 new 4 per cent. bonds, interest guaranteed by the Mobile & Ohio Co., lessee.

Southern Pacific.—A force of 800 Chinese and 400 white laborers are now employed on the extension of the Northern Division from Soledad, Cal., southward. A considerable amount of work has been completed on the grading, and track is reported laid for 15 miles. The tracklayers will follow up the grading as closely as possible.

Staten Island Rapid Transit Co.—This company has sold \$2,200,000 of its second mortgage 5 per cent. bonds to Hallgarten & Co., of New York, and Robert Garrett & Son, of Baltimore, at a price not stated. The entire issue is \$2,500,000, but \$300,000 have previously been sold. The property covered by this mortgage includes the railroad on Staten Island, the projected bridge over the Arthur Kill, and the terminal property on the line which is to be completed by the Baltimore & Ohio Co. when its line is completed.

Stony Clove & Catskill Mountain.—Summer travel has begun on this road, and the latest time-table shows seven trains a day each way. The road runs from Phenicia, N. Y., on the Ulster & Delaware road, through the Stony Clove to Hunter in the heart of the Catskill Mountain region. A branch (the Kaaterskill road) connects it with the Hotel Kaaterskill. While its principal business is in summer, it is also the only one of the mountain railroads which has any business at all in winter.

Texas & Pacific.—The committee appointed at a recent meeting of stockholders and bondholders has prepared a plan of reorganization as follows:

A new consolidated bond shall be put upon the property, with interest at the rate of 3, 4 and 5 per cent., beginning on July 1, 1887. The 5 per cent. class is for consolidated bondholders of the Eastern Division, the 5 per cent. to be for five years, after which it will become a 6 per cent., or, at the option of the holders, 5 per cent. with 20 per cent. in income bonds; the 4 per cent. is for the holders of the New Orleans Pacific bonds, and the 3 per cents. are for the Texas Rios. A 3 per cent. income bond will be issued in exchange for the present income land grant bonds. The land will be placed in the hands of trustees, and the first \$750,000 of sales will go into the treasury of the company. The proceeds of the remainder will be used in buying up and retiring income bonds. Income bonds will be given for accumulated interest on all classes of bonds in the proportions following: To the Eastern Division, 100 per cent.; to the New Orleans Pacific Division, 65 per cent.; to the Rio Grande Division, 50 per cent. The terminal bonds will be exchanged for income bonds. There will be \$2,000,000 additional of 5 per cent. consolidated bonds, to remain in the treasury for future contingencies. The stock will be assessed 5 per cent.

The committee, whose deliberations resulted in the drafting of this plan, is composed of Henry Clews, M. Burr, John Bloodgood, and P. J. Goodhart. Messrs. Clews, Burr, and Bloodgood approve the plan. Mr. Goodhart voted against it as not likely to secure the indorsement of shareholders.

Toledo, St. Louis & Kansas City.—This company, which is successor to the Toledo, Cincinnati & St. Louis, has arranged to issue new first mortgage bonds to the amount of \$2,000 per mile. A contract has been signed with a syndicate, represented by Mr. S. H. Kneeland, of New York, who agree to convert the road from 3 ft. to standard gauge and to put it in good order and provide necessary equipments, taking in payment the entire amount of the new bonds.

The old first mortgage bonds are to be exchanged for preferred stock and the stock of the old company for new common stock.

The following circular has been issued by President J. M. Quigley, dated Toledo, O., June 19:

"This is to give notice, that the above named company (the Toledo, St. Louis & Kansas City Railroad Co.) has this day formally taken title to, and possession of, the lines of road and property hitherto known as the Toledo and the St. Louis divisions of the Toledo, Cincinnati & St. Louis Railroad Co.

"All officers and employees are retained in the respective positions they have heretofore occupied."

Wabash, St. Louis & Pacific.—In the United States Court in Chicago, June 25, a bill was filed by Charles H. Beers and other bondholders to foreclose the first mortgage for \$4,500,000 on the Chicago Division. The bill represented that the mortgage was given to raise the funds to pay for the Chicago Division; that the company has defaulted on the payment of interest on these bonds, and that the trustees under the mortgage have failed or refused to act in protection of the interests of the bondholders. The plaintiffs therefore claim the right to prosecute the case and ask that the Court direct that the income of the Chicago Division be separated and applied to the payment of interest on the bonds, and other measures taken to protect the interests of the bondholders, including the appointment of a special receiver for the Chicago Division. The complaint further charges that the issue of bonds on this division has been in excess of the amount authorized by the mortgage to the amount of \$368,800, and that there is no means of ascertaining the disposition made of this illegal excess.

Current report is the effect that the holders of the prior lien bonds are not generally accepting the proposition of the Reorganization Committee that they shall accept reduced rates of interest. It is said that a number of large holders have agreed to insist upon their rights, believing that it would be better for them if the Committee's plan should fail. In that case, the Committee will be unable to comply with the terms of the court, and a resale of the road will be ordered, when the prior lien bondholders can combine and buy in the property for themselves, leaving out the consolidated bonds altogether.

West Jersey.—The statement for May and the five months to May 30 is as follows:

	May.	1885.	1886.	1885.
Earnings	1886.	1885.	1886.	1885.
Expenses	\$104,326	\$96,060	\$430,258	\$399,745
Net earnings	87,277	60,403	300,172	264,021
Interest, rentals, etc.	\$17,049	\$35,666	\$130,086	\$135,724
Net surplus	103,701	95,474	\$96,385	\$40,250

For the five months the gross earnings increased \$30,513, or 7.6 per cent., and the expenses \$36,151, or 13.8 per cent., leaving a decrease in net earnings of \$5,638, or 4.1 per cent. The fixed charges increased \$8,227, or 8.7 per cent., the result being a decrease of \$13,865, or 17.6 per cent., in the net surplus.

Wheeling & Lake Erie.—This company has filed articles of incorporation, the incorporators being the bondholders who bought the Wheeling & Lake Erie road recently at foreclosure sale. The capital stock of the new company is \$3,600,000.

ANNUAL REPORTS.

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Central Pacific.

For the months of January and February, 1885, this company worked the same lines, 2,802.45 miles, as in 1884, including the Southern Pacific from Goshen to El Paso. In March it worked only the Central Pacific proper and leased lines, 1,649.86 miles, having surrendered the Southern Pacific leases. On April 1 it leased all its lines to the Southern Pacific Co., which now operates them. The report of the company shows the operations of the Central Pacific lines for the year ending Dec. 31.

The equipment of the railroad lines was transferred to the Southern Pacific Co. at the time the lease was made. The floating equipment includes 10 steam ferry-boats, 3 river steamers and 2 barges. The ferry-boats ran 185,294 miles last year.

The financial condition of the company, as stated in the President's report, is as follows:

Capital stock outstanding.....	\$59,275,500
Funded debt (\$58,264,000, less sinking funds).....	49,287,924
Floating debt (\$2,484,204, less cash and notes due).....	1,414,393
Trustees land grant mortgage.....	1,107,247
Sundry accounts.....	13,604
U. S. subsidy bonds.....	27,855,680
" " interest, less paid by transportation.....	20,017,182
Total liabilities.....	\$159,701,533
Road and equipment.....	\$155,441,728
Stocks and bonds.....	1,074,440
Trustees land grant mortgage.....	1,137,347
Deferred payments on land contracts.....	1,124,129
Estimated value unsold lands.....	24,000,000
" " water front and terminals.....	7,750,000
	190,497,544

Balance of assets over liabilities..... \$30,796,069

During the year the floating debt was reduced \$10,338,697, the money being obtained from sale of supplies to the Southern Pacific Co., from surplus income and from the issue of \$5,000,000 new land grant bonds.

The train and car mileage is given for both years on the entire 2,802.45 miles (including the Southern Pacific to El Paso) as operated in 1884; it is as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Passenger trains.....	3,296,459	3,380,323	D.	2.5
Freight ".....	4,557,848	5,074,615	D.	10.2
Service ".....	298,216	692,455	D.	55.0
Switching.....	1,234,880	1,67,041	D.	21.2
Total loco. miles.....	9,387,397	10,684,434	D.	12.1
Passenger train cars.....	19,515,499	18,072,691	I.	8.0
Freight cars.....	78,830,457	85,431,527	D.	7.7
Service cars.....	219,302	173,950	I.	26.1
Total car miles.....	98,565,238	103,698,063	D.	4.9

Locomotive service cost last year 34.13 cents per mile run; maintenance of cars cost 0.63 cent per car mile. Locomotives ran 1.19 miles to each revenue train mile.

The traffic reported on the same lines was as follows:

	1885.	1884.	Inc. or Dec.	P. c.
Passengers.....	97,065	95,987	I.	1.1
Through.....	2,129,137	2,225,970	D.	4.6
Local.....	6,574,939	6,451,887	I.	1.9
Ferry.....	8,795,141	8,773,853	I.	0.3
Total.....	378,421	361,024	I.	4.8
Through.....	1,939,041	1,992,131	D.	2.6
Local.....	427,415	515,255	D.	17.1
Company's.....	2,745,777	2,868,410	D.	4.3

The ferry passengers are those who use the ferries between Oakland and San Francisco, and who ride from 4 to 8 miles in the cars, besides the ferry passage.

The number of passengers carried on the lines north of Goshen, excluding the Southern Pacific, was: Through, 81,361; local, 1,708,206; ferry, 6,574,939; total, 8,364,506.

The earnings (for the full year) of the lines north of Goshen, 1,649.86 miles, excluding the Southern Pacific, were:

	1885.	1884.	Inc. or Dec.	P. c.
Freight.....	\$8,570,393	\$9,137,304	D.	6.2
Passengers.....	4,772,432	5,334,413	D.	10.5
Mail and exp.....	637,847	835,273	D.	2.5
Miscellaneous.....	403,749	889,890	D.	54.6
Total.....	\$14,384,421	\$15,996,970	D.	10.1
Expenses.....	6,306,599	8,338,588	D.	24.4

Net earn..... \$8,077,822 \$7,658,382 I. \$419,440 5.5
Gr. earn p. m. 8.719 9.006 D. 977 10.1
Net..... 4.896 4.642 I. 254 5.5
P. c. of exps..... 43.8 52.1 D. 8.3

The most notable point in this statement is the extraordinary reduction in working expenses.

During the year 12,559 ties of track were renewed with steel rails and 210,518 new ties were laid. The usual improvements of road and equipment were made and a block-signal system erected and put in use at Oakland.

The statement for the nine months (April-December) during which the road was worked by the Southern Pacific Co. is as follows:

Gross earnings.....	\$11,480,862
Expenses, taxes and betterments.....	\$5,406,160
Rentals of leased lines.....	1,083,414
Interest on bonds.....	2,044,023
Floating debt.....	100,920
Sinking fund and government requirements.....	764,312
Balance, net profit due Central Pacific Co.....	\$1,482,033

betterments, \$91,758. The requirements of the government were \$303,915, and payments to the company's sinking funds were \$460,397.

The operations of the lines worked prior to April 1 (2,802.45 miles for January and February, and 1,649.86 miles in March) were:

Gross earnings.....	\$3,966,655
Working expenses.....	\$2,668,527
General expenses, taxes, etc.....	729,940
Shrinkage of supplies, old accounts etc.....	317,872

Profit for the three months.....	\$252,316
Less interest for three months.....	1,079,176

Net loss for three months..... \$826,860

The result of the year may be stated in a condensed form as follows:

Profit for nine months under lease.....	\$1,482,033
Dividends on investments.....	7,300
Interest earned on sinking funds.....	6,403
Land sales used to redeem land bonds.....	271,000

Total.....	\$2,376,265
Loss for three months prior to lease.....	\$826,860
Land Department expenses.....	61,525
Land bonds redeemed.....	271,000
Sinking funds, etc.....	847,111

Balance, surplus of income.....	\$367,769
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The land receipts are not included, except the amount actually applied to reduction of the land grant bonds during the year.

The Land Agent reports the total sales for the year at \$440,660, of which \$401,173 were time sales and \$43,487 cash sales. The total receipts on land contracts were \$499,950, and from timber, etc., \$1,946. The trustees under the land grant mortgage report receipts of \$499,950, which, added to a balance of \$883,297 on hand, made a total of \$1,383,247. The trustees redeemed 273 bonds at a cost of \$276,000, leaving a balance of \$1,107,247 on hand at the close of the year.

The President's report contains a long statement of the working of the Thurman act and of the injustice to the company, in which, he claims, the operations of the law result.

Southern Pacific Company.

The first annual report of this company shows that on Dec. 31, 1885, it operated and controlled the following lines:

Central Pacific and leased lines.....	Miles.
Southern Pacific, Northern Division.....	202.21
Southern Pacific (Goshen to El Paso) and leased lines.....	1,152.59

Total Pacific System.....	3,004.66
Atlantic System:	
Galveston, Harrisburg & San Antonio.....	932.90
Texas & New Orleans.....	208.67
Louisiana Western.....	112.00
Morgan's Louisiana & Texas.....	281.30
Gulf, Western Texas & Pacific.....	66.00
New York, Texas & Mexican.....	92.00

Total mileage worked.....	1,092.87
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In addition to these railroad lines the company operates ferries on the bay of San Francisco and steamboat lines on the Sacramento River in the Pacific System; and in the Atlantic System steamboat lines from Morgan City, La., to Pin Hook and St. Martinsville, 262 miles; ferry steamers at New Orleans; ocean steamship lines from Morgan City to Galveston, Brazos Santiago, Corpus Christi and Vera Cruz; New Orleans to New York and to Tampa, Key West and Havana.

The Central Pacific was operated from April 1, 1885; the Southern Pacific from March 1, 1885. The lines in the Atlantic System were operated from March 1, 1885, with the exception of the New York, Texas & Mexican, which was worked from Sept. 1.

The equipment in use at the close of the year was as follows:

	Pacific Sys.	Atlantic Sys.	Total.
Locomotives.....	462	204	666
Passenger cars of all classes.....	280	80	360
Sleeping and parlor cars.....	55	17	72
Emigrant sleeping cars.....	96	12	108
Baggage, mail and express cars.....	111	51	162
Box, stock and fruit cars.....	5,010	3,088	8,098
Flat, gondola and coal cars.....	3,340	2,544	5,884
Caboose cars.....	144	68	212

There is also a full equipment of service and hand cars on the several lines.

The floating equipment owned and operated is as follows:

	Pacific System.	Atlantic system.	Total.
Ferry and transfer steamboats.....	10	6	16
River steamboats.....	3	2	5
Ocean steamships.....	19	19	38

The ocean steamships include nine of the largest class, employed on the lines from Norfolk to New Orleans, ten smaller ones used on the lines from Morgan City to the Gulf ports. In addition to the river steamboats there are two freight barges employed in the Sacramento River trade.

Two of the ferry steamboats on San Francisco Bay are now burning petroleum as fuel, instead of coal.

The general account, condensed, is as follows:

Capital stock (authorized \$100,000,000) issued.....	\$88,580,130
Interest due and accrued.....	3,137,820
Vouchers, pay-rolls, accounts and balances.....	6,283,980
Lessor companies, net profits.....	2,593,723

Total liabilities.....	\$100,575,653
Stocks owned.....	\$87,648,180
Bonds owned.....	999,000
Supplies for current operations.....	3,649,817
Central Pacific Co.....	3,550,575
Accounts and balances receivable.....	2,441,332
Cash.....	2,461,955

Surplus of assets over liabilities.....	\$184,206
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The bonds owned are \$1,110,000 Galveston, Harrisburg & San Antonio Western Division second. The amounts given above are the cost to this company of the stocks and bonds, not their par value.

The stocks owned are as follows:

Southern Pacific, California.....	Shares.
" " Arizona.....	436,849
" " New Mexico.....	199,930
Galveston, Harrisburg & San Antonio.....	258,120
Texas & New Orleans.....	50,000
Louisiana Western.....	33,600
Morgan's Louisiana & Texas.....	40,627
New York, Texas & Mexican.....	5,940
Mexican International.....	41,721

Total shares.....	1,183,665
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The funded debt consists of \$1,215,000 coupon and \$385,000 registered first-mortgage 7s. Included in securities owned is \$586,270 of the company's own stock.

The earnings for the year were as follows:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Freight.....	\$692,034	\$726,080	D. \$34,046	4.7
Passengers.....	279,052	306,327	D. 27,275	8.9
Mail and express.....	83,400	81,200	D. 2,200	2.6
Rents, etc.....	6,136	13,719	D. 7,583	55.3

Total.....	\$1,060,631	\$1,127,388	D. \$66,757	5.9
Expenses.....	747,312	804,606	D. 57,294	7.1

Net earnings.....	\$313,419	\$322,782	D. \$9,363	2.9
Gross earn. per mile.....	13.358	14.199	D. 842	5.9
Net.....	3.947	4.065	D. 118	2.9
Percent of expenses.....	70.5	71.4	D. 0.9	...

The decrease in earnings is due entirely to lower rates, the traffic of the road showing an increase last year.

The expenses were divided as follows:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Conducting transportation.....	\$276,476	261	\$394,755	26.2
Motive power.....	198,660	18.9	239,831	21.3
Maintenance of way.....	122,183	11.5	109,718	9.7
Maintenance of cars.....	69,038	6.5	83,676	7.4
General expenses.....	79,855	7.5	76,626	6.8

Total.....	\$747,212	70.5	\$804,606	71.4
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The reduction in motive power expenses was chiefly due to a decrease in repairs of engines and to decreased cost of fuel, coal costing \$1.30 per ton, against \$1.62 in the preceding year. The increase of maintenance of way was due to larger renewals of track and bridges.

The result of the year was as follows:

Net earnings as above.....	\$313,419
Interest on investments, etc.....	37,217
Profit on St. L., Vandalia & T. H. lease.....	7,834

Total.....	\$358,470
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Interest on bonds.....	\$112,000
Loss on T. H. & Logansport lease.....	76,634
Betterments to T. H. & Logansport road.....	45,202
Dividends, 6 per cent.....	119,289

Balance, surplus for the year.....	\$55,345
Balance, Nov. 1, 1884.....	1,420,126

Balance, surplus, Oct. 31, 1885.....	\$1,425,471
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This surplus of income account is mainly invested in improvements of road and securities of leased lines.

The traffic for the year was as follows:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Pass. train miles.....	244,458	228,586	I. 15,872	6.9
Freight train miles.....	463,641	474,284	D. 8,643	1.8
Total locomotive miles.....	1,125,968	1,118,555	I. 7,413	0.7
Pass. car miles.....	1,574,548	1,403,843	I. 110,705	7.0
Freight car miles.....	10,013,464	10,449,081	D. 435,617	4.1
Passengers carried.....	313,685	339,870	D. 26,185	7.7
Passenger miles.....	12,111,811	12,221,035	D. 169,224	0.9
Tons freight carried.....	1,459,388	1,367,303	I. 92,085	6.7
Ton miles.....	78,060,483	74,362,830	I. 3,697,653	5.0

Av. train load:	
Passengers, No.....	49.5
Freight, tons.....	157.0

Inc. or Dec.	P. c.
3.5	6.8
10.6	8.8

The earnings per train mile last year were 94.7 cents; expenses, 66.7; net earnings, 28.0 cents. The average train was 6.44 passenger or 19.28 loaded freight cars, 5 empty cars being counted as 3 loaded ones. Locomotive service cost 16.71 cents per mile run. Locomotives ran 1.58 miles to each revenue train mile. The cost of hauling a passenger car one mile was 2.49 cents; a freight car, 0.84 cent. Of the freight car mileage 64.1 per cent. was of loaded cars.

The average rates on traffic were as follows, in cents:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Local.....	2.840	2.785	I. 1.647	
Through.....	1.950	2.270	I. 0.580	
Average.....	2.304	2.507	I. 0.887	
Cost.....	1.936	1.723	I. 0.798	

Net earnings.....	0.668	0.784	I. 0.184
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Through business furnished 60 per cent. of the passenger miles and 70 per cent. of the ton-miles.

During the year 994 tons of steel rails and 39,931 new ties were used in renewals; 12 miles of track were re-ballasted. Two new iron bridges were built. Two new shifting engines were built in the company's shops. The road and equipment were generally maintained in good condition.

The decrease in the earnings for the year was due entirely to the very low rates obtained on the through business, which forms so large a part of the traffic of the road.

The report of the St. Louis, Vandalia & Terre Haute has already been published, in the number for April 23 last, page 292.

TERRE HAUTE & LOGANSPORT.

This line extends from Terre Haute, Ind., to South Bend, 182.7 miles; there are 26.018 miles of sidings. The road was completed through to South Bend Nov. 24, 1884.

The equipment included 12 locomotives; 6 passenger and 3 baggage cars; 34 box, 6 stock, 593 coal and 8 caboose cars. There are also 136 leased coal cars on the road.

The earnings for the year were as follows:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Freight.....	\$288,163	\$219,625	I. \$68,538	31.2
Passengers.....	125,753	109,278	I. 16,475	15.1
Mail, etc.....	20,340	13,201	I. 7,139	54.0

Total.....	\$434,246	\$342,104	I. \$92,142	26.9
Expenses.....	447,320	340,027	I. 107,293	31.6

Net earnings.....	\$13,274	\$2,077	I. \$15,351
Gross earn. per mile.....	2.406	2.231	I. 175
Net.....	14	14	I. 3.7
Percent of expenses.....	103.1	99.4	I. 3.7

* Deficit.

The increase in expenses was due to increased train service and greater length of road worked—an average of 180.5 miles last year against 153.4 in the preceding year.

The rental (25 per cent. of gross earnings) was \$108,562, making the total loss for the year \$121,836.

The traffic for the year was as follows:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Pass. train miles.....	230,807	228,586	I. 2,221	0.9
Freight train miles.....	358,093	342,284	I. 15,809	4.4
Total loco. miles.....	588,900	570,870	I. 18,030	3.0
Passenger car miles.....	704,468	598,239	I. 106,229	17.8
Freight car miles.....	5,244,895	3,421,496	I. 1,823,399	53.3
Passengers carried.....	232,593	240,663	D. 8,072	3.4
Passenger miles.....	4,772,260	4,201,162	I. 571,098	13.6
Tons freight carried.....	356,577	204,627	I. 151,950	34.8
Ton-miles.....	23,726,554	14,483,743	I. 9,242,811	63.8

Av. train load:	
Passengers, No.....	20.7
Freight, tons.....	66.3

Inc. or Dec.	P. c.
0.075	0.030

The earnings per train mile last year were 67.2 cents; expenses, 69.2; loss, 2.0 cents per mile. Locomotive service cost 16.38 cents per mile run. The average train was 3.05 passenger or 12.50 freight cars. The cost of hauling a passenger car one mile was 3.54 cents; a freight car, 1.40 cents. Of the whole tonnage moved, 53 per cent. was coal.

The earnings per passenger and per ton-mile were, in cents:

	1884-85.	1885-86.	Inc. or Dec.	P. c.
Local.....	2.726	2.630	I. 0.979	1.224
Through.....	2.224	2.258	I. 0.548	0.547
Average.....	2.636	2.601	I. 0.849	0.889
Cost.....	2.805	2.704	I. 0.924	1.019

Local business last year furnished 70 per cent. of the ton-miles and 80.5 per cent. of the revenue from freight.

During the year 14,746 miles of track were relaid with steel, and 29,035 new ties were laid; 14 miles of track were ballasted. A new iron bridge was built over the Wabash River at Logansport, and several wooden bridges were renewed. A total amount of \$45,202 was expended in improvements in road, and included in expenses.

The stocks owned are, in every case, a controlling interest. It will be noted that the company does not own any Central Pacific stock.

The earnings of all the lines worked, for the periods stated above, were as follows:

	Pacific System.	Atlantic System.	Total.
Earnings.....	\$17,154,848	\$7,851,958	\$25,006,806
Expenses.....	7,726,809	4,422,954	12,149,823

Net earnings.....	\$9,427,979	\$3,428,304	\$12,856,283
Gross earnings per mile.....	5.709	4.638	5.373
Net.....	3.138	2.055	2.737
Percent of expenses.....	45.0	50.3	48.6

None of the lines were operated for a full year, and no comparisons are made. The earnings and expenses include those of the steamship lines and of the river lines and ferries.

The operations of the several lines were as follows:

	Earnings.	Expenses.	Net earnings.
Cent. Pac. and leased lines.....	\$11,339,484	\$4,721,558	\$6,617,926
Southern Pacific, No. Div.....	1,096,841	659,504	437,337
Southern Pacific, other lines.....	4,577,539	2,303,898	2,273,641
Sacramento River steamers.....	110,984	101,908	9,076
Gal., Har. & San Antonio.....	2,747,300	1,438,034	1,309,272
N. Y., Tex. & Mexican.....	56,709	64,111	32,598
Gulf, W. Tex. & P.....	28,430	20,291	8,139
Texas & N. Orleans.....	872,587	444,837	427,750
Louisiana Western.....	535,595	239,510	296,085
Morgan's La. & Tex.....	3,570,640	2,216,370	1,354,470

Separate reports are made giving the details of operations of the different lines, and summaries of these reports will be published hereafter.

The income statement is as follows, condensed:

	Pacific System.	Atlantic System.	Total.
Net earnings.....	\$9,427,979	\$3,428,304	\$12,856,283
Rentals received.....	370,187	45,750	415,937

published hereafter.

The income statement is as follows, condensed :

	Pacific	Atlantic
Total.....	\$9,798,166	\$3,474,054
Rentals and taxes.....		